5.0 Weight-of-Evidence Methodology

5.1 Introduction

The comparisons of data distributions between Old Phase I and Phase II/New Phase I and the risk inferences based on the results of those comparisons are best described as a semiquantitative, weight-of-evidence approach. Without detailed risk modeling as was performed for Old Phase I sources (which were themselves no more than best *estimates*), no definitive statements are possible about unknown Phase II/New Phase I source risks to surrounding receptors. However, we can make statistical comparisons of risk-affecting variables between Old Phase I and Phase II/New Phase I and use the collective results of those comparisons to make our best judgment about the unknown Phase II/New Phase I risks relative to known (modeled) Old Phase I risks.

The weight-of-evidence methodology is based on the results of hypothesis tests of equality between selected statistics of the Old Phase I and Phase II/New Phase I variable distributions. Hypothesis tests of equality were performed for comparisons of selected, relevant percentiles as well as for testing equality of correlation coefficients. Testing for equality of percentiles is motivated by the argument that, all other factors being equal, differences in high-end risks are directly related to differences in important, risk-affecting variables at the tails of their distributions. For example, if emission rates were the only difference between two sets of combustor facilities, then the difference in, say, 90^{th} percentile risks between these two sets would be approximately linearly related to differences in their 90^{th} percentile emission rates. (Note that this assumes the variable being tested has an important effect on risk and will influence the upper tail of the risk distribution.) Hypothesis tests of percentiles were performed using the chi-squared test, a robust nonparametric method, but one that requires reasonably large sample sizes. Where sample sizes were inadequate for the chi-squared test, the Wilcoxon Rank Sum test was used. Both the chi-squared and the Wilcoxon tests are described in Section 4.

All hypothesis tests were performed at a significance level (α) of 0.10. The significance level determines the value of the test statistic used as the cutoff for accepting or rejecting the null hypothesis and represents the probability of rejecting the null hypothesis when it is true (i.e., a false positive or Type I error). The significance level is also referred to as the confidence level ($1-\alpha$), which for $\alpha = 0.10$ is 0.9 or 90 percent. The significance level is discussed further in Section 5.4.

The test of equality of correlation coefficients is motivated by an attempt to consider the complex interactions of many risk-affecting variables for the two sets of facilities being compared. A simple, variable-to-variable comparison as performed for percentile equality testing does not address the fact that risk-affecting variables may be correlated (e.g., emission rates and stack height), and this joint relationship may provide additional useful information for relative risk inferences. If the comparisons of distribution percentiles tests similarity between variables, then the test of equality of correlation coefficients tests similarities among and between variables. Hypothesis tests of equality of two correlation coefficients were performed using a nonparametric procedure based on Spearman rank correlation coefficients as described in Section 4.

All hypothesis tests were performed at a significance level (α) of 0.10. The significance level determines the value of the test statistic used as the cutoff for accepting or rejecting the null hypothesis and represents the probability of rejecting the null hypothesis when it is true (i.e., a false positive or Type I error). The significance level is also referred to as the confidence level ($1-\alpha$), which for $\alpha = 0.10$ is 0.9 or 90 percent. The significance level is discussed further in Section 5.4.

Computationally, the weight-of-evidence methodology is implemented in two steps for any given comparative scenario. First, the two data sets for which percentiles and correlation coefficients are to be compared are prepared and the desired statistics are calculated by SAS and output in a comma-delimited format.[1] A Visual Basic computer program called RelRisk then reads the SAS outputs, assigns "scores" and "reliabilities," generates "counts,"and performs the MOE calculations as described below. RelRisk was developed by RTI specifically for this study.

5.2 Scores and Rationale for "+1" Scores

Within the weight-of-evidence methodology, the results of each statistical hypothesis test are summarized with respect to relative direction of expected risk for Phase II/New Phase I versus Old Phase I by assigning a numerical score. "Relative direction of expected risk" means whether the statistical comparison suggests that Phase II/New Phase I risks would be (1) no different than, (2) greater than, or (3) less than Old Phase I risks. As mentioned above, the scores are assigned for both direct variable-to-variable comparisons of percentiles and comparisons of correlation coefficients. The scores are ordinal scores and indicate only the expected relative risk direction based on that comparison only, i.e., assuming that all other Phase II/New Phase I risk-influencing factors are the same. A score of 0 reflects no significant statistical difference for the comparison; therefore, one would not expect a significant difference in relative risk. A score of +1 or -1 indicates that a statistically significant difference was found. The -1 score indicates that the difference is in a direction unfavorable to Phase II/New Phase I risk vis-a-vis Old Phase I risk, i.e., Phase II/New Phase I would be expected to have higher risks. Conversely, a +1 score indicates that Phase II/New Phase I would be expected to have lower risks and, therefore, is risk-favorable.

5.2.1 Percentile Scores

Given that the most relevant portion of the distribution of individual risk is the upper tail, e.g., 90th percentile risk, scores for the distribution percentile comparisons were based on comparisons of percentile equality at that tail of the data distributions most relevant to the upper

[1] SAS is the registered trademark of SAS Institute Inc., Cary, NC.

tail of risk. For chemical emission rate comparisons, that is also the upper tail because, all other things being the same, receptor risk increases with increasing emission rate. For certain other variable comparisons, e.g. stack height, scoring was based on comparing lower tail percentiles (10^{th} or 25^{th}) because, all other things being the same, shorter stacks will result in increased risk due to less efficient atmospheric mixing and dispersion. In addition, for some chemicals and some variables, it is arguable that risks of interest to EPA are more sensitive to central tendency (mean or median) values of risk-affecting variables than tail percentiles. For example, as the site total population count parameter, alpha, increases from site to site or, possibly, from Old Phase I to Phase II/New Phase I , more people are exposed to some level of risk. Because differences at the mean or median would reflect differences in total population at some risk, a central tendency statistic of Phase II's alpha distribution relative to a central tendency statistic of Phase I's alpha distribution is a more relevant comparison than comparing upper tail percentiles.[2] Similarly, for PM-related risks, comparisons of central tendency are also more relevant to risks of regulatory concern, because these risk measures are population-based and relate to overall changes from some baseline condition (e.g., decrease in the incidence of respiratory problems from lower ambient PM concentrations resulting from new air pollution controls) and hence, are better represented by means or medians rather than tail percentiles.

Table 5-1 presents both the basis (central tendency, upper tail, or lower tail) and the criteria used for assigning the Phase II/New Phase I , risk-favorable Percentile Score (PS) of +1. UT1 refers to the upper tail percentile (90^{th} or 75^{th}) for Old Phase I data. UT2 is upper tail for Phase II/New Phase I data. LT1 is lower tail percentile (10^{th} or 25^{th}) for Old Phase I. LT2 is lower tail percentile for Phase II/New Phase I . Median 1 and Median 2 are Old Phase I and Phase II/New Phase I distribution medians, respectively. The descriptions of the variables provided previously (in Section 3) should help to understand the basis of the "+1" conditions presented in Table 5-1. For example, LT2 > LT1 as +1 condition for stack height comparisons reflects the fact that, all other factors being equal, high stacks reduce risks to individuals relative to low stacks. Thus, the relevant tail of the stack height distributions being compared is the lower tail, because low stack heights increase high end risks (all other things being the same). Therefore, if the stack heights in the lower tail are greater than the lower tail values in the distribution to which it is being compared, then the comparison would be regarded as risk-favorable.

For some distribution comparisons, it is not intuitively obvious whether a tail comparison is most relevant, which tail should be compared, or even in which direction the risk-favorable comparison would be. For example, a higher frequency of low windspeeds might cause greater risks for sources near ground level (due to less dilution) but result in lower risks for elevated, buoyant plumes released from a stack (as a result of enhanced plume rise due to less mixing). While higher annual precipitation could increase risks associated with wet deposition to soils and crops, increased wet scavenging reduces air concentrations and therefore could decrease risks associated with direct air uptake. For these comparisons, we simply test the distribution medians for equality. If they are not statistically different, then the comparison would be considered risk-

[2] Sites with higher population densities are also of interest but only in relation to some other risk-affecting variable, such as emissions. Therefore, these relationships are examined in the context of the correlation comparisons rather than the percentile comparisons.

Table 5-1. Percentile Comparisons Scoring Basis and Criteria[a]

Megavariable	Subvariables Comprising Megavariable	Frequency Variables Comprising Subvariable	Basis for PS and Condition for PS = +1	
			Tail Comparison	Central Tendency Comparison
Site Emission Rate, ***Emission***			UT1 > UT2[b]	Median 1 > Median 2[c]
Site Stack Characteristics	***Height***		LT2 > LT1	
	BuoyFlux		LT2 > LT1	
Meteorological	Mixing Height	***Mix500*** (<= 500 m)		H0
		Mix1000 (<= 1000 m)		H0
		Mix1500 (<= 1500 m)		H0
	Wind Speed	***WS1*** (<= 1 m/s)		H0
		WS3 (<= 3 m/s)		H0
		WS5 (<= 5 m/s)		H0
		WS10 (<= 10 m/s)		H0
	Stability Class	***SC_ABC*** (A, B, or C)		H0
		SC_EFG (E, F, or G)		H0
	CircVar (Wind Direction Circular Variance)		LT2 > LT1	
	Precip (Long-term Mean Precipitation)			H0
Population[d]	***Alpha***			Median 1 > Median 2
	Beta		LT2 > LT1	

[a] Variable names appearing in bold italics denote the specific variable names used in the hypothesis tests.
[b] For all chemicals except PM.
[c] For PM only.
[d] There are alpha and beta parameters specific to several receptor categories (e.g., residents, farmer children). ***A_ALL*** and ***B_ALL*** are the alpha and beta, respectively, that pertain to the general populations (i.e., without regard to subpopulations) and were used in the analyses for all chemicals except dioxin TEQ and lead. For TEQ, the "all farmers parameters" were used (***A_FARM*** and ***B_FARM***). For lead, the 0 - 5 year old child resident parameters were used (***A_KID*** and ***B_KID***).

neutral and assigned a PS of 0.[3] If they are different (though it is unclear what the risk consequences of that difference might be) they are scored 888 to signify "not zero." These comparisons are denoted by H0 in Table 5-1. The score 999 denotes comparisons for which the data were insufficient to allow a statistical hypothesis test to be made.

5.2.2 Correlation Coefficient Scores

The percentile scores are intended to represent direct variable-to-variable comparisons and are predicated on the assumption that all else is the same. Because this assumption seldom holds in practice, it is important to also examine the relationships *among* the variables. This is accomplished by comparing the various correlations among the variables.

The purpose in assigning correlation coefficient comparison scores is identical to that for percentile comparison scores—to determine relative risk directions—but the interpretation of differences in correlation coefficients is somewhat less straightforward than for the percentile comparisons. Consider, for example, a comparison of correlation coefficients between stack emission rate and stack height for Old Phase I versus Phase II/New Phase I . A correlation coefficient varies between -1 and +1, with -1 reflecting a perfect inverse relationship (e.g., emission rate decreases as height increases or vice-versa) and a +1 reflects a perfect direct relationship. Consider first only the Old Phase I correlation coefficient and what it implies for Old Phase I risks. Suppose the Old Phase I correlation coefficient for stack emission rate/stack height were positive. What does that relationship between these two important risk-affecting variables suggest for risks from Old Phase I facilities relative to the risks that might result if the correlation coefficient were negative (inverse relationship)? It suggests that, all other things being the same, high-end risks will be lower because as emission rate increases (thus tending to increase risks), stack height also increases, tending to offset the risk increase. Thus, for emission rate and stack height, a positive correlation coefficient is desirable for decreasing risks, and the more positive it is, the better for lowering risks.

Returning to the assignment of relative scores for comparison of Old Phase I versus Phase II/New Phase I correlation coefficients for the example of stack emission rate and stack height, if a positive correlation coefficient is desirable and Phase II/New Phase I's correlation coefficient is significantly different from Old Phase I's and has a larger value, then that bodes favorably for Phase II/New Phase I risks versus Old Phase I risks, and a correlation score of +1 is assigned. Under this logic, the Phase II/New Phase I correlation coefficient doesn't have to be positive, it simply has to be significantly different from Phase I's and have a larger value. For example, a Phase II/New Phase I correlation coefficient of -0.5 versus -0.8 for Old Phase I would result in a +1 score, assuming that the hypothesis test indicates that the two are, in fact, significantly different.

The conditions for a "+1" correlation score among compared megavariables, subvariables, or frequency variables are shown in Table 5-2. R1 and R2 denote the correlation coefficient for Old Phase I and Phase II/New Phase I , respectively. "R2 > R1" means that a

[3] Although we could have tested other percentiles for equality in these cases in addition to the median (e.g., quartiles), we chose to simplify the comparisons and test only the medians.

score of +1 was assigned if the correlation coefficient for that pair of compared distributions had a larger value for Phase II/New Phase I than for Old Phase I. The table is symmetrical about the diagonal. Where a +1 or -1 score was ambiguous, we again simply give a score of either 0 or 888 (not zero). Those situations are denoted by H0 in the table.[4] Again, 999 is scored when the data are insufficient to allow an hypothesis test of equal correlation coefficients.

Table 5-2. Correlation Scoring Basis and Criteria

Variable	Emission	Height	Buoyflux	Alpha	Beta	Precip	Mix500	Mix1000
Emission	N/A	R2 > R1	R2 > R1	R1 > R2	R2 > R1	H0	H0	H0
Height	R2 > R1	N/A	R1 > R2	R2 > R1	R1 > R2	H0	H0	H0
Buoyflux	R2 > R1	R1 > R2	N/A	R2 > R1	R1 > R2	H0	H0	H0
Alpha	R1 > R2	R2 > R1	R2 > R1	N/A	R2 > R1	H0	H0	H0
Beta	R2 > R1	R1 > R2	R1 > R2	R2 > R1	N/A	H0	H0	H0
Precip	H0	H0	H0	H0	H0	N/A	H0	H0
Mix500	H0	H0	H0	H0	H0	H0	N/A	H0
Mix1000	H0	H0	H0	H0	H0	H0	H0	N/A
Mix1500	H0	H0	H0	H0	H0	H0	H0	H0
CircVar	R2 > R1	R1 > R2	R1 > R2	R2 > R1	R1 > R2	H0	H0	H0
WS1	H0	H0	H0	H0	H0	H0	H0	H0
WS3	H0	H0	H0	H0	H0	H0	H0	H0
WS5	H0	H0	H0	H0	H0	H0	H0	H0
WS10	H0	H0	H0	H0	H0	H0	H0	H0
SC_ABC	H0	H0	H0	H0	H0	H0	H0	H0
SC_EFG	H0	H0	H0	H0	H0	H0	H0	H0

Variable	Mix1500	CircVar	WS1	WS3	WS5	WS10	SC_ABC	SC_EFG
Emission	H0	R2 > R1	H0	H0	H0	H0	H0	H0
Height	H0	R1 > R2	H0	H0	H0	H0	H0	H0
Buoyflux	H0	R1 > R2	H0	H0	H0	H0	H0	H0
Alpha	H0	R2 > R1	H0	H0	H0	H0	H0	H0
Beta	H0	R1 > R2	H0	H0	H0	H0	H0	H0
Precip	H0	H0	H0	H0	H0	H0	H0	H0
Mix500	H0	H0	H0	H0	H0	H0	H0	H0
Mix1000	H0	H0	H0	H0	H0	H0	H0	H0
MIX1500	N/A	H0	H0	H0	H0	H0	H0	H0
Circvar	H0	N/A	H0	H0	H0	H0	H0	H0
WS1	H0	H0	N/A	H0	H0	H0	H0	H0
WS3	H0	H0	H0	N/A	H0	H0	H0	H0
WS5	H0	H0	H0	H0	N/A	H0	H0	H0
WS10	H0	H0	H0	H0	H0	N/A	H0	H0
SC_ABC	H0	H0	H0	H0	H0	H0	N/A	H0
SC_EFG	H0	H0	H0	H0	H0	H0	H0	N/A

[4] Note that if either of the variables in the correlation is shown as H0 in Table 5-1, the correlation is given as H0 in Table 5-2.

5.3 Procedure for Weight-of-Evidence Scoring

Given the above background on how individual comparisons of both distribution percentiles and correlation coefficients are scored, the flowchart presented in Figure 5-1 summarizes the overall methodology and is discussed in more detail in this section. The result of the procedure is a numerical Grand Score and a set of normalized counts for each chemical and Phase II/New Phase I source subcategory compared. The Grand Score is a weighted average of the percentile and correlation coefficient scores, while the counts give the fraction of all possible scoring outcomes associated with each specific score. The Grand Score and the various counts are alternative means of aggregating the individual percentile comparisons and correlation coefficient comparison scores to reflect whether, for a given chemical, the Phase II/New Phase I source subcategory would be expected to have risks either less than, equal to, or greater than the Old Phase I subcategory's high-end risks.

The Grand Score is calculated only for the non-H0-type variable comparisons. The H0-type comparisons (i.e., where a rejection of the null hypothesis of equality cannot be scored either +1 or -1) confounds the Grand Score calculation. To account for the H0-type comparisons, as well as to provide an alternative (to the Grand Score) means of assessing the weight-of-evidence information, all scoring outcomes (-1, 0, +1, 888, or 999) are counted and reported as a weighted fraction of the total number of comparisons attempted.

The overall weight-of-evidence approach is predicated on the assumption that (1) the percentile comparisons and the correlation comparisons for a given variable are equally important (i.e, comparisons of the interrelationships among the variables are just as important as comparisons of the magnitudes of the variables themselves); (2) each of the four megavariables (i.e., emissions, stack characteristics, meteorological conditions, and population) represent important, risk-determining factors, but may be given different weights (see Section 6); and (3) each subvariable (and frequency variable) measures distinct attributes of a megavariable and bear upon it equally (e.g, windspeed vs. stability class vs. mixing height subvariables within the meteorological megavariable). With that in mind, the procedure used goes as follows:

- ***Step 1*** is to assign the Percentile Score (PS). The PS is based either on an upper tail comparison, a lower tail comparison, or comparison of medians, as appropriate for the distribution being compared (see Table 5-2). If the chi-squared test cannot be performed, the Wilcoxon Rank-Sum test is used where possible. The PS can take on values of -1, 0, +1, 888, or 999. A reliability is also assigned to the (non-999) PSs on a scale of 1 to 4, with 1 being the highest reliability. These reliability assignments are discussed in Section 5.4.

- ***Step 2*** is the assignment of a Correlation Score (CS) for each pairwise comparison of Phase II/New Phase I correlation coefficients with Old Phase I correlation coefficients. The comparison is based on a statistical hypothesis test that there is no difference between the two correlation coefficients. The variables for which correlation coefficients are estimated and statistically compared are shown in Table 5-2. If the Spearman rank correlation coefficient equality hypothesis test (see Section 4.3.5) for comparing R1 and R2 could not be performed due to data limitations, no alternative method was attempted and the correlation score was

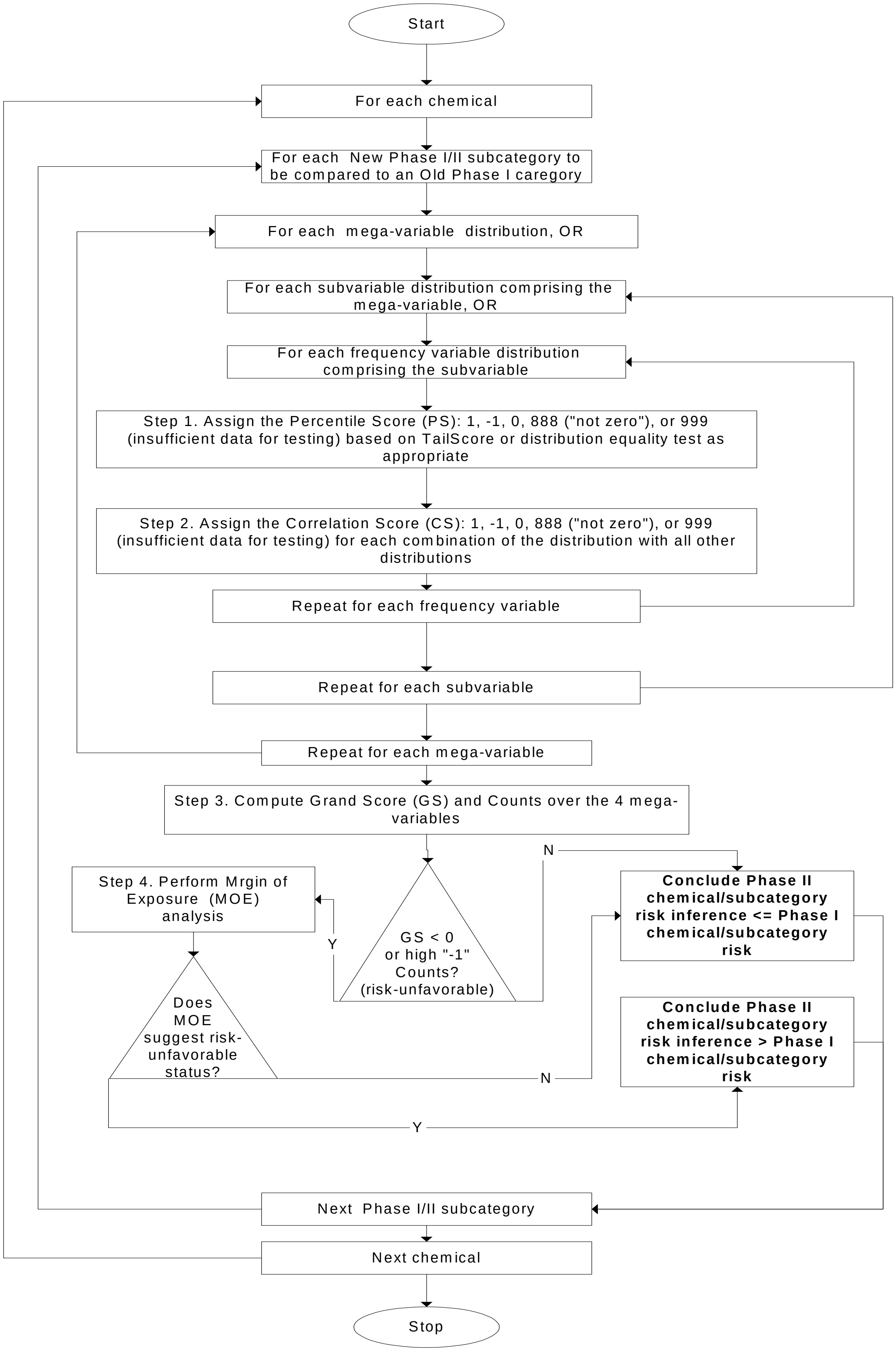

Figure 5-1. Weight-of-evidence methodology.

assigned as 999. For a given variable, the CSs are accumulated across the correlations with the other variables. A reliability is also assigned to the (non-999) CSs on a scale of 1 to 4, with 1 being the highest reliability. These reliability assignments are discussed in Section 5.4.

- ***Step 3*** is the calculation of the Grand Score and the 5 counts. The Grand Score also ranges from -1 to +1 and is aggregated over all PSs and CSs at the three data distribution levels (megavariable, subvariable, frequency variable). The Grand Score applies only to the non-H0-type comparisons. The counts record the number of score-specific outcomes, which are then normalized to a fraction of the total number of possible scoring outcomes. The Grand Score and counts aggregate PSs and CSs according to the following weighting assumptions:

  – *Assumption 1*. Each megavariable aggregation can be assigned a user-specified weight, depending on its relative importance.

  – *Assumption 2*. Each subvariable aggregation within a megavariable is given equal weight.

  – *Assumption 3*. Each frequency variable aggregation within a subvariable is given equal weight.

  – *Assumption 4*. Within any data distribution level (megavariable, subvariable, or frequency variable) aggregation of PS and cumulative CS, the PS and the cumulative CSs are given equal weight.

  – *Assumption 5*. Within any cumulative CS, each individual CS is given equal weight.

The Grand Score weighting scheme can be summarized mathematically as follows:

$$GS = \frac{\sum_{i=1}^{NMV} w_i \left(GSMV_i\right)}{\sum_{i=1}^{NMV} w_1} \qquad (5\text{-}1)$$

where

NMV = number of megavariables (for which no 999 comparison conclusions were made)

w_i = megavariable weight

$GSMV_i$ = aggregate score for megavariable *i*, which is calculated as

$$GSMV_i = \frac{PS_i + \frac{1}{NC(ij)} \sum_{m}^{NC(ij)} CS_m(ij)}{NScore} \quad if \quad NSV(i) = 0 \tag{5-2}$$

or

$$GSMV_i = \frac{1}{NSV(i)} \sum_{j=1}^{NSV(i)} GSSV_{ij} \quad if \quad NSV(i) > 0 \tag{5-3}$$

where

NSV(i)	=	number of subvariables for megavariable *i* (for which no 999 comparison conclusions were made)
NC(ij)	=	number of CSs for subvariable *j* of megavariable *i* (for which no 999 comparison conclusions were made)
CS_m(ij)	=	the m^{th} CS for subvariable *j* of megavariable *i*
NScore	=	2, if PS and cumulative CS not equal to 999 or 1 if PS or cumulative CS equal 999
$GSSV_{ij}$	=	aggregate score for subvariable *j* of megavariable *i*, and is calculated as

$$GSSV_{ij} = \frac{PS_{ij} + \frac{1}{NC(ij)} \sum_{m=1}^{NC(ij)} CS_m(ij)}{NScore} \quad if \quad NFV(ij) = 0 \tag{5-4}$$

or

$$GSSV_{ij} = \frac{1}{NFV(ij)} \sum_{k=1}^{NFV(ij)} GSFV_{ijk} \quad if \quad NFV(ij) > 0 \tag{5-5}$$

where

NFV(ij)	=	number of frequency variables for subvariable *j* of megavariable *i* (for which no 999 comparison conclusions were made)
$GSFV_{ijk}$	=	aggregate score for frequency variable *k* (of subvariable *j* and megavariable *i*) and is similarly calculated as

$$GSFV_{ijk} = \frac{PS_{ijk} + \frac{1}{NC(ijk)} \sum_{m=1}^{NC(ijk)} CS_m(ijk)}{NScore} \tag{5-6}$$

The individual reliability indices associated with each individual PS and CS are also aggregated into a weighted average index reflecting the overall reliability associated with the Grand Score. The weighting and aggregation scheme is identical to that described above for computing the Grand Score, except that the PS and CS reliability index values (ranging from 1 to 4) are used in lieu of the PS and CS values themselves. Thus, the range on the Grand Score Reliability Index is from 1 (most reliable) to 4 (least reliable). The assignment of reliabilities is discussed in Section 5.4.

The 5 counts (-1, 0, +1, 888, and 999) are aggregated using the same weighting assumptions as given previously. The counts are then normalized such that they specify the fraction of the total number of comparisons attempted that resulted in each of the 5 counts, appropriately weighted (i.e. the 5 counts sum to 1.0).

5.3.1 Example of Grand Score and Counts

To illustrate both the Grand Score and counts calculations with a simple example, suppose there are three megavariables (***Emission,*** stack, and meteorological), all equally weighted. For ***Emission***, there are no variables or frequency variables. For stack, assume there are two subvariables, ***Height*** and ***BuoyFlux,*** with no subordinate frequency variables. For meteorological, assume there is a single subvariable, stability class, with two subordinate frequency variables, ***SC_ABC*** and ***SC_EFG***. Thus, there are five data distributions (***Emission***, ***Height***, ***BuoyFlux***, ***SC_ABC***, and ***SC_EFG***) for which PSs and CSs can be computed and scored. The assumed PS and CS scoring results for this example are given in Tables 5-3 through 5-6.

Table 5-3. Example PS Results

Mega-Variable	Sub-Variable	Frequency Variable
Emission (+1)	-	-
Stack	***Height*** (0)	-
	BuoyFlux (-1)	-
Meteorological	Stability Class	***SC_ABC*** (0)
		SC_EFG (888)

Table 5-4. Example CS Results for Frequency Variables (FV)

FV	FV/*Emission*	FV/*Height*	FV/*BuoyFlux*	FV/*SC_ABC*	FV/*SC_EFG*
SC_ABC	888	0	0	-	888
SC_EFG	999	0	999	888	-

Table 5-5. Example CS Results for Subvariables (SV)

SV	SV/*Emission*	SV/*Height*	SV/*BuoyFlux*	SV/*SC_ABC*	SV/*SC_EFG*
Height	+1	-	999	0	0
BuoyFlux	0	999	-	0	999

Table 5-6. Example CS Results for Megavariables (MV)

MV	MV/*Emission*	MV/*Height*	MV/*BuoyFlux*	MV/*SC_ABC*	MV/*SC_EFG*
Emission	-	+1	0	888	999

5.3.2 Grand Score for Example

Consider the emission megavariable first. There is one PS (***Emission***) and 2 non-H0-type CSs (***Emission/Height*** and ***Emission/BuoyFlux***). Under weighting Assumption 5 above, the equally weighted average of the CSs is (1+0)/2 = 0.5. Under Assumption 4, giving equal weight to the PS and cumulative CSs results in an aggregate score of (1 + (1+0)/2)/2 = 0.75.

Now consider the stack megavariable. It consists of two subvariables, each of which will contribute equal weight (Assumption 2) to the stack megavariable score. Each subvariable will have a PS and 2 non-H0-type CSs. (Note that all pairwise correlations are being included in each distribution's cumulative CS. This appears to be double-counting, but in fact it is appropriate to maintain the weighting scheme.) The score for subvariable ***Height*** is (0 + (1/1))/2 = 0.5. Note that although two CSs are possible for ***Height***, one of them (***Height/BuoyFlux***) was not testable due to insufficient data, so the denominator in the average CS calculation (1/1) reflects only the single, testable CS. Similarly, for subvariable, ***BuoyFlux***, the score is (-1 + (0/1))/2 = -0.5. Under Assumption 2, the stack megavariable aggregated score is then (0.5 - 0.5)/2 = 0.

Finally, consider the meteorological megavariable. It consists of a single subvariable, stability class, which in turn is comprised of two frequency variables, ***SC_ABC*** and ***SC_EFG***. Because both of these subvariables are H0-type comparisons, they are not included in the Grand Score calculation, and the number of megavariables involved in the Grand Score calculation is reduced from 3 to 2.

Under Assumption 1 then, the aggregated Grand Score is calculated as the equally weighted average of the ***Emission*** megavariable score and the stack megavariable score, or (0.75 + 0)/2 = 0.375.

5.3.3 Count of Zeros for Example

Again, consider the emission megavariable first. There is one PS (***Emission***) and 4 CSs (***Emission/Height***, ***Emission/BuoyFlux***, ***Emission/SC_ABC***, and ***Emission/SC_EFG***). Under weighting Assumption 5, the fraction of the number of CSs that resulted in 0 is 1/4 = 0.25. Under weighting Assumption 4, and given that the PS score is nonzero, the zero count score for the emission megavariable is (0 + 1/4)/2 = 0.125. (Note that the 0 and 1 in this calculation are *counts* of the zero score, not the score itself as was the case for the Grand Score.)

Now consider the stack megavariable and its two subvariables. Each subvariable will have a PS and 4 CSs. The zero count score for subvariable ***Height*** is (1 + (2/4))/2 = 0.75. Similarly, for subvariable ***BuoyFlux***, the score is (0 + (2/4))/2 = 0.25. Under Assumption 2, the stack megavariable aggregated score is then (0.75 + 0.25)/2 = 0.5.

Finally, consider the meteorological megavariable. It consists of a single subvariable, Stability Class, which in turn is comprised of two frequency variables, ***SC_ABC*** and ***SC_EFG***. The zero count scores for ***SC_ABC*** and ***SC_EFG*** are, respectively, (1 + 2/4)/2 = 0.75 and (0 + 1/4)/2 = 0.125. Under Assumptions 2 and 3, the meteorological megavariable aggregated zero count score is then (0.75 + 0.125)/2 = 0.4375.

Under Assumption 1 then, the aggregated zero count score is calculated as the equally-weighted average of the ***Emission*** megavariable zero count score, the Stack megavariable zero count score, and the meteorological megavariable zero count score, or (0.125 + 0.5 + 0.4375)/3 = 0.354.

A similar procedure would be followed for the +1 count score, the -1 count score, the 888 count score, and the 999 count score. Note that the sum of these 5 count scores will necessarily be 1.0, so that each count score reflects the fraction of the total count score attributable to that score.

5.4 PS and CS Reliability Assignments

Numerical reliability indices are assigned to the hypothesis tests underlying the PS and CS. Like the PSs and CSs themselves, these reliabilities are ordinal values and attempt to assign relative differences to the uncertainties associated with the PSs and CSs, given data limitations. Thus, the term "reliability" is used here to reflect uncertainty in the hypothesis test underlying a PS or CS assignment. The important distinction here is that we are not addressing the reliability of our inferences with the reliability assignments, only the reliability of the outcome of the statistical tests (i.e., the rejection of the null hypothesis).

Two types of erroneous outcomes are possible from the hypothesis tests: false positives ("Type I error") and false negatives ("Type II error"). The null hypothesis (H0) is that no difference exists between the two statistics being compared (percentiles for PSs and correlation coefficients for CSs). The probability of a Type I error (i.e., erroneously reject H0 when it is true) is set by the test criterion, α. The test's "p-value" is a measure of the credibility of H0. If the p-value is less than α (not to be confused with the "alpha" discussed previously in the context of population distribution), then H0 is rejected; otherwise, it is "not rejected," i.e., it is tacitly accepted. In the present context, a Type I error would result in erroneously assigning a PS or CS value of +1, -1, or 888 (a significant difference), when in fact a value of 0 (no difference) should be assigned. In contrast, a Type II error would result in assigning a PS or CS value of 0, when in fact there is a significant difference and the true score is either +1, -1, or 888. The probability of a Type II error is denoted as β (not to be confused with the "beta" discussed previously in the context of population distributions). If β is the probability of (erroneously) accepting a false H0 (false negative), then 1 - β is the probability of *correctly* rejecting a false H0. 1 - β is called the "power" of the hypothesis test.[5]

[5] It is arguable that a Type II error that misses a true PS or CS of -1 (risk-adverse) is of greater regulatory concern than a Type I error that concludes a difference when there is not one.

For a fixed sample size, there is a competition between α and β. If α is decreased to reduce false positives, then β necessarily increases and more false negative errors are made. Only by having more information (larger sample sizes) can both α and β be simultaneously reduced. Traditionally, hypothesis testing is performed using an α of 0.05 (95 percent confidence). However, because of the concern for keeping Type II errors reasonably small, and given the relative paucity of data available for some of the comparisons, EPA decided to use an α of 0.10 for this analysis to further mitigate Type II error rates (at the expense of a 5 percent additional Type I error rate).

Given a value of α (e.g., 0.10) and a fixed sample size, there is a relationship between the power ($1 - \beta$) and the magnitude of the difference that one can detect statistically. That is, a relatively large difference can be detected without incurring many false negatives (i.e., the power is high if the resolution is low [large difference]). Conversely, if one wants to try to detect very small differences with few data (the resolution is high), then many false positive errors will be made and the power is low. This relationship between the power of the test and the ability to detect different magnitudes of differences can be reflected by a "power curve."

With this background on Type I and II errors and the power of a statistical test, the assignment of reliabilities to PSs and CSs can now be discussed. For PSs, the reliability assignment attempts to reflect both the ability or inability to test H0 at the *desired* distribution percentile and the relative difference that can be detected at a given power. The strategy for assigning PS reliabilities is a 2-step process if H0 is not rejected. If H0 is rejected, it is a 1-step process. (This distinction is explained later.) The first step is to assign a reliability based on the percentile that can be statistically tested using the chi-squared test relative to the percentile that you want to test. If the percentile that can be tested is the same as the one you want to test, then the reliability index is conditionally assigned a value of 1. If data limitations require that a percentile not as far in the distribution tail be tested instead of the percentile you want to test (e.g., 75^{th} instead of 90^{th}), then the reliability assignment is 2. If, because of data limitations, you must back up even further into the distribution to use the chi-squared test at the median, then the reliability is set at 3. For rejection of H0, these reliabilities are the final reliabilities, i.e. PSs = +1, -1, or 888 will have reliability of 1, 2, or 3 depending on the percentile at which H0 was rejected versus the percentile you wanted to test. (If H0 can be rejected, even with very small sample sizes, and the samples are representative of the populations,[6] then the observed difference is so large that there is virtually no possibility that the true percentiles are equal.)

For acceptance of H0 (i.e., PS = 0), the possibility of a false negative (Type II error) exists and the second step in assigning the reliability considers the magnitude of the difference between the two percentiles being tested that is statistically discernable at $\alpha = 0.1$ and $\beta = 0.2$ from the power curve. (EPA has determined that a power of 0.8, i.e. Type II error probability of 0.2, is appropriate for this analysis.) It was assumed for this analysis that the ability to detect a true relative difference between percentiles of 25 percent or less was acceptable. Therefore, if the power curve for the particular sample sizes being compared indicates that the sample sizes

[6] The real issue in this situation is whether the small samples are in fact random (i.e., representative) samples of the underlying populations. If they are not, then the premise of hypothesis testing is itself questionable. Nonetheless, the reason for small "sample" sizes in some of the combustor categories is simply that the population itself is very small. Therefore, the "samples" include most, if not all, of the present-day population, so they are essentially "representative" by default.

are sufficient to detect a relative difference of 25 percent or less, then the tentative reliability assigned according to the percentile being tested, as discussed above, is set as the final reliability. If not (i.e., the data are insufficient to give this precision), then a 1-step “penalty” is added to the tentative reliability; i.e., the reliability would be increased from 1 to 2, from 2 to 3, or from 3 to 4. The power analysis data for the chi-squared test are included in Appendix C. These data were used to fit a regression model to interpolate the difference in the percentiles that can be statistically detected at $\alpha = 0.1$ and $\beta = 0.2$ as a function of the two sample sizes. That model is

$$\Delta = 2.91\left(N_1 + N_2\right)^{-0.58} \tag{5-7}$$

where

Δ = the absolute value of the fractional difference detectable between the two percentiles.

The regression model has a coefficient of determination, R^2, of 0.99. RelRisk uses this relationship to interpolate the difference given the sample sizes.

These four reliabilities also reflect the hierarchical order in which RelRisk attempts the percentile comparisons using the chi-squared test. The chi-squared test is *computationally* possible to apply even for relatively small sample sizes. However, the chi-squared test is most appropriate for large samples and, although it is possible as a computational matter to generate p-values even for small samples, these are not judged reliable when the samples do not satisfy the criteria given previously in Table 4-3. Therefore, RelRisk first attempts to test H0 at the desired percentile (e.g., 90th). If these threshold sample size requirements for the chi-squared test are not satisfied, it next attempts to test H0 at the next-removed percentile (e.g., 75th instead of 90th). If the threshold sample size requirements are again not satisfied, the chi-squared test is finally attempted at the median (50th percentile). Should the threshold sample size requirements for the chi-squared test also fail at the median, the final fall-back is to use the Wilcoxon (Mann-Whitney) rank sum test to test H0. The Wilcoxon test of H0 is essentially that the two distributions have a common location parameter (i.e., equal central tendency), under the assumption that the two populations have similar dispersion. Even when samples are quite small (i.e., less than 10), the Wilcoxon test can be computed and, in such situations, is more reliable than the chi-squared test. Thus, we employ the Wilcoxon test preferentially for small samples and assign it a lower reliability than the chi-squared test. (The reason for the lower reliability is the sample size; the test itself is not inherently more or less reliable for evaluating hypotheses about medians than is the chi-squared test.) Thus, whatever the reliability assignment was when the algorithm reached the Wilcoxon test, the reliability is then given a 1-step penalty, which would result in a maximum final reliability value of 4.

A final reliability value of 4 could result *either* because the procedure desired to test H0 at the 90th (or 10th) percentile, but dropped back to use the chi-squared test at the median, and also incurred a 1-step penalty due to the detectable relative difference exceeding 25 percent at the median, *or* because it dropped further back to apply the Wilcoxon test. (The reliability would have been 3 before the Wilcoxon test was invoked.) At the other extreme, the Wilcoxon test could result in a final reliability of 2 if the median were the desired percentile to test, but the data were insufficient to test H0 at the median so the Wilcoxon test was then invoked. (The reliability would have been 1 before the Wilcoxon test was invoked.)

The assignment of the desired percentile at which to test H0 reflects the size of the population of combustors. For combustor categories that comprise a relatively large number of sites (e.g., New Phase I All Incinerators category with 72 sites), it is appropriate to compare a percentile that is relatively far out on the distribution tail (e.g., 90^{th} percentile) as relevant to the particular variable being compared (e.g., upper tail for emissions or lower tail for average stack height). The 90^{th} (or 10^{th}) percentile assumes that the tails of the distribution of individual risks are of concern. However, several source categories involve *populations* of sites that are quite small; for example, the Phase II SB category comprises only 4 sites. This is the full population of SB sites as it currently exists.[7] In situations such as these, the concept of the 90th or 75th percentile makes little sense. Rather, some other (lower) percentile is more relevant for hypothesis testing. Accordingly, desired (relevant) percentiles for these comparisons were assigned to the four smallest combustor categories as presented in Table 5-7. The relevant tail percentile for all other combustor categories is the 90th/10th.

Table 5-7. Relevant Tail Percentiles for Hypothesis Testing for Smallest Combustor Categories

Source Category	Number of Sites in Population	Relevant Percentile
Phase II SB	4	50^{th}
New Phase I LWAK	3	50^{th}
Phase II Dry LB	6	75th/25th
Phase II HAF	8	75th/25th

For CSs, the “relevant percentile”is not an issue, and the assignment of reliabilities is based solely on the relative difference in correlation coefficients that is statistically discernable (at $\alpha = 0.1$ and $\beta = 0.2$) given the sample sizes. For consistency with the PS reliabilities, the range of CS reliabilities is also specified on an ordinal scale of 1 (highest reliability) to 4 (lowest) as follows.

A power analysis was performed on the Spearman rank correlation coefficient test statistic across a range of alternative sample sizes (N_1 and N_2). The results of this analysis are presented in Appendix C. There is a relationship between the sample sizes and the relative difference between R_1 (the first population’s sample correlation coefficient) and R_2 (the second population’s sample correlation coefficient) that can be detected at $\alpha = 0.1$ and $\beta = 0.2$. This relationship was estimated from the power analysis data for a range of N_1 and N_2 values. At the low end of sample sizes evaluated, $N_1 = N_2 = 10$, it is possible to detect a difference (absolute value) between R_1 and R_2 of approximately 0.7. (The range of possible absolute differences is 0

[7] Arguably, the sites as they currently exist are a snapshot of the (unknown) population of sites to which the MACT rule will eventually apply, considering that older sources will close at some point (or cease burning hazardous waste) while other, newer sources will come online.

to 2.0. A value of 2.0 would correspond to R_1 = +/- 1 and R_2 = -/+ 1.) At the higher end of sample sizes evaluated ($N_1 = N_2 = 100$), a difference of approximately 0.1 can be detected. Given that the actual N_1 and N_2 values for the various source category comparisons will fall approximately within these extremes, the range of detectable differences (0.1 to 0.7) was disaggregated into four categories: (1) less than 0.2, (2) between 0.2 and 0.4, (3) between 0.4 and 0.6, and (4) greater than 0.6. Once the actual detectable difference is estimated given N_1 and N_2 for any specific comparison, the CS reliability is assigned either 1, 2, 3, or 4, respectively, according to which of the above categories the detectable difference belongs. A two-dimensional, cubic polynomial, interpolating spline function[8] is used by RelRisk to interpolate the detectable difference (given N_1 and N_2). The spline function's parameters were estimated from the discrete set of sample sizes for which the power curves were generated.

5.5 Margin of Exposure Analysis

The motivation for the MOE analysis is that, for instances where the Grand Score or the counts (i.e., where the weight of evidence) appear to suggest the chemical pollutant may pose greater risks for the Phase II/New Phase I facilities than were modeled for the Old Phase I facilities, it would be useful to look at the point estimates of emissions themselves (corresponding to the percentiles used for hypothesis testing) to see whether, considering emissions alone, risks could rise to a level of concern. Therefore, an additional calculation was performed in which the MOE from the original risk assessment was adjusted based on the point estimates of emissions. (As discussed in Section 6.0, it was subsequently determined that the MOE analysis provides a key piece of the weight of the evidence and that it has an important role to play independent from the Grand Score and counts.) An MOE is the ratio of a threshold exposure level that would result in a risk of concern (e.g., 10^{-5} excess lifetime cancer risk) to an estimated exposure:

$$MOE = \frac{Exposure*}{Exposure} \tag{5-8}$$

where

Exposure* = the threshold exposure of concern
Exposure = the estimated exposure.

For example, if the estimated exposure at a given percentile of the distribution of individual risk for a receptor population of interest is associated with an excess lifetime cancer risk of 1E-6 and the cancer risk level of concern is 1E-5, then the MOE is 10. Noncancer risks are treated in a similar fashion. If the estimated exposure at a given percentile of the distribution

[8] French curves or flexible elastic "splines" are used by draftsmen to force a smooth curve through a set of points. The mathematical analog of this mechanical tool is a cubic polynomial interpolating spline function. The spline function is commonly used for interpolation in relatively noise-free tables (Hornbeck, 1975). The implementation of the cubic polynomial spline employed in this application is 2-dimensional, i.e. a spline surface was fit to the N_1, N_2, and detectable difference data. Once fit to the available power data, the spline smoothly interpolates among arbitrary values of N_1 and N_2 of interest to return the interpolated detectable difference.

of HQ is associated with an HQ of 0.01, and the noncancer exposure level of concern is an HQ of 1, then the MOE is 100. MOEs below 1 at a given percentile of the distribution indicate that exposures to the receptor population are above a level of concern at that percentile. The adjustment effectively discounts the MOE by the difference in emission rates at the upper tail of the emissions distribution. While an oversimplification, the emissions-adjusted MOE serves as an indicator or flag that the risks could exceed a level of concern based simply on emissions.

The MOE analysis was performed as follows.

- ***Step 1***—Get the actual (modeled) MOE for Old Phase I facilities on a chemical- and Phase I subcategory-specific basis. Those MOEs were obtained for several percentiles of the Old Phase I modeled risk distributions and reflect MOEs for the most exposed receptor for each chemical. Old Phase I MOEs for the 1999 MACT standards are presented in Tables 1-2 and 1-3. MOEs in both tables are for the subcategories All Incinerators, CKs, and LWAKs. Old Phase I MOEs for pooled CK and LWAK subcategories use the most limiting MOE of the CK and LWAK subcategories. The dioxin TEQ MOE used in this analysis is the 2000 value.

- ***Step 2***—Get the upper confidence limit (UCL) on that percentile of the emission distribution for both the Old Phase I emissions and the emissions to which it is being compared (Phase II or New Phase I) at which the emissions were compared for the PS. Calculate the ratio of the Phase II (or New Phase I) UCL to the Old Phase I UCL:

$$Emission\ Ratio = \frac{P2\ UCL}{P1\ UCL} \qquad \text{(Eq. 5-9)}$$

If that ratio exceeds the Old Phase I MOE (using the MOE percentile of regulatory interest), then the Phase II (or New Phase I) chemical emissions are of potential concern.

- ***Step 3***—Calculate the threshold exceedance ratio from the emission ratio and the Old Phase I MOE:

$$Threshold\ Ratio = \frac{Emission\ Ratio}{P1\ \ MOE} \qquad \text{(Eq. 5-10)}$$

If the emission ratio exceeds the Old Phase MOE, then the threshold is exceeded (i.e., the threshold ratio > 1) and the higher the threshold ratio, the higher the exceedance.

It must be emphasized that the emission-adjusted MOEs that result from application of the above procedure should not be construed as predictions of the level of risk. Instead, they are only intended to provide an indication of whether risks could exceed a level of concern based on simplifying assumptions and, as such, are subject to a considerable degree of uncertainty.

6.0 Cross-Validation Analysis

6.1 Background

This section describes a so-called cross-validation analysis that was undertaken to evaluate the performances of various "decision rules" that use the weight-of-evidence information described in Section 5 and to select a decision rule for use in inferring Phase II/New Phase I risks. "Cross-validation" refers to a process whereby a data set for which certain characteristics or parameters are known *a priori* is partitioned into two subsets. Some type of model (e.g., a decision rule) is applied to one of the subsets to estimate the parameters of the data. The estimated parameters are then fixed in the model and it is used in a predictive mode and benchmarked against the second data subset. If those predictions are in reasonable agreement with the second data subset, the values of which were not used for parameter estimation, then the model is "validated." The cross-validation approach is used in the present context to determine which decision rules perform relatively well when attempting to infer risks from Old Phase I combustor categories for which those risks are already known (modeled).

The cross-validation analysis considered three Old Phase I categories: (1) all commercial incinerators, (2) small, onsite incinerators, and (3) large, onsite incinerators. These categories were selected by EPA for this analysis primarily based on relatively large sample sizes of 21, 43, and 80 for commercial incinerators, large onsite incinerators, and small onsite incinerators, respectively, so that sparse data sets would not unduly influence the analysis. As two of these categories are being compared to each other for a given chemical, the assumption of the cross-validation analysis is that the true risks for one of them is not known, but is to be inferred based on the known true (modeled) risk of the other and the scores, counts, and/or estimated MOE. Nine chemicals were selected as the basis of the cross-validation analysis: dioxin TEQ, lead, arsenic, beryllium, cadmium, chlorine, chromium +6, hydrogen chloride, and mercury. Old Phase I emissions from both the 1999 MACT standards as well as the 1999 rule baseline were also used. True MOEs for both baseline and MACT were calculated from the risk results documents (RTI, 1999) for the 90th, 95th, and 99th percentiles of risks and provided by EPA. The MOEs are presented in Tables 6-1 and 6-2. Upper confidence limits on modeled risk were used where available for the MOEs. For example, from Table VII-A152 of Volume 2 of the risk results documents (RTI, 1999), the 90th percentile inhalation cancer risk for exposure to chromium +6 from large onsite incinerators for 6- to11-year old children of home gardeners is 6E-08, with a 90 percent confidence interval of 1E-08 to 1E-07. Using a 1E-05 target cancer risk, the MOE is then calculated, using the upper confidence limit, as 1E-05/1E-07 = 100, as shown in Table 6-1.

Table 6-1. MOEs for MACT Baseline Emissions

Chemical	90th Percentile	95th Percentile	99th Percentile
Commercial Incinerators			
Arsenic	200	100	20
Beryllium	50,000	20,000	5,000
Cadmium	1,000	500	200
Chlorine	20	6	2
Chromium +6	3,000	1,000	500
Dioxin TEQ (2000)	0.6	0.3	0.08
Hydrogen chloride	1,000	1,000	500
Lead	70	60	40
Mercury	100	100	50
Large Onsite Incinerators			
Arsenic	30	20	10
Beryllium	5,000	5,000	2,000
Cadmium	50	50	20
Chlorine	20	20	4
Chromium +6	100	50	20
Dioxin TEQ (2000)	1.7	0.8	0.2
Hydrogen chloride	200	100	100
Lead	10	10	8
Mercury	500	200	100
Small Onsite Incinerators			
Arsenic	5,000	2,000	1,000
Beryllium	200,000	100,000	100,000
Cadmium	20,000	10,000	10,000
Chlorine	20	10	6
Chromium +6	1,000	1,000	500
Dioxin TEQ (2000)	1.7	0.8	0.2
Hydrogen chloride	1,000	500	100
Lead	1,000	1,000	1,000
Mercury	200	100	50

Table 6-2. MOEs for MACT Standard Emissions

Chemical	90th Percentile	95th Percentile	99th Percentile
Commercial Incinerators			
Arsenic	500	500	200
Beryllium	200,000	100,000	10,000
Cadmium	10,000	3,000	1,000
Chlorine	30	10	5
Chromium +6	10,000	10,000	3,000
Dioxin TEQ (2000)	5	2	0.8
Hydrogen chloride	1,000	1,000	500
Lead	500	500	300
Mercury	1,000	200	100
Large Onsite Incinerators			
Arsenic	500	500	500
Beryllium	10,000	10,000	5,000
Cadmium	1,000	1,000	1,000
Chlorine	40	20	10
Chromium +6	500	300	200
Dioxin TEQ (2000)	5	3	1.7
Hydrogen chloride	1,000	1,000	300
Lead	1,000	1,000	1,000
Mercury	500	200	100
Small Onsite Incinerators			
Arsenic	10,000	10,000	3,000
Beryllium	300,000	200,000	100,000
Cadmium	50,000	30,000	10,000
Chlorine	60	40	10
Chromium +6	3,000	1,000	200
Dioxin TEQ (2000)	10	8	2
Hydrogen chloride	3,000	2,000	500
Lead	1,000	1,000	1,000
Mercury	200	100	50

To generate the cross-validation scores, counts, and estimated MOEs, 108 runs of RelRisk were performed. These 108 runs consist of 2 scenarios (MACT, baseline) x 9 chemicals x 6 permutations of the three combustor categories (all commercial incinerators, small onsite incinerators, and large onsite incinerators) taken two at a time. Each run consists of a given MACT- or baseline-based emissions, chemical, and comparison between two of the three Old Phase I categories. Again, in each run, one of the combustor categories is treated as having unknown risks, which are to be inferred on the basis of the scores, counts, and/or predicted MOEs from the comparative analyses. The scores, counts, and predicted MOEs are presented in

Table 6-3.[1] Note that the term "predicted MOE" is employed in this discussion solely for the purpose of evaluating the cross-validation methodology and does not connote any intent to regard the emission-adjusted, i.e., "estimated", MOEs as predictions of actual risks when applied in the context of the comparative analysis, where the risks are unknown. The category for which the risk inferences are desired is labeled as "P2 Category." The category for which the risks are assumed to be known is labeled as "P1 Category." Also shown in Table 6-3 are the true MOEs for the P1 and P2 categories and the P2 MOE prediction ratios (predicted/observed) for the three MOE percentiles. These ratios involve data transformations to make them more amenable to statistical analysis as discussed later.

6.2 Correlations

To facilitate the development of alternative decision rules, it is useful to examine some of the scores, counts, and aggregated counts to see to what extent they are correlated with the difference between the true P2 MOE and the true P1 MOE. The true MOEs are an absolute surrogate for the true (modeled) risks; the larger the MOE, the lower the risk. Therefore, if a significant correlation exists between the ratio of true P2 MOE/true P1 MOE and one or more of the scores or counts, then that would be useful information in selecting a decision rule. Use of this ratio was found to be somewhat problematic for purposes of meaningful correlations, however, because the values that the ratio can take on are from 1 to infinity for true P2 MOE > true P1 MOE, while the values for true P2 MOE < true P1 MOE are limited to the range of 0 to 1. To make the distribution of all potential values more symmetrical, the negative inverse of the ratio (-true P1 MOE/true P2 MOE) was used to estimate the correlation coefficients when true P2 MOE < true P1 MOE. All subsequent correlations with the ratio "true P2 MOE/true P1 MOE" shall be understood to include this modification. (This is simply a transformation of the data to make it more suitable for statistical analysis.) Table 6-4 presents the correlations between selected scores/counts and this MOE ratio, along with p-values for the significance of the correlation. The variable, Grand Score/Grand Score Reliability, is a normalized Grand Score and attempts to take the Grand Score reliability into account. Because the Grand Score reliability ranges from 1 (most reliable) to 4 (least reliable), dividing by the reliability should weight the Grand Score so that less reliable values are discounted in the correlation. (The potential range of the Grand Score, -1 to +1, is unchanged by this reliability weighting.)

[1] Note that the table is too wide to fit on one page, so is presented in three parts.

Table 6-3a. RelRisk Outputs for Cross-Validation Analysis (Part 1 of 3)

Run No.	MACT Option	P1 Category	P2 Category	Chemical	Grand Score	Grand Score Reliability	GS/GS Reliability	Count Zero	Count +1	Count -1	Count 888	Count 999
1	MACT	CINC_ALL	OINC_L	TEQ	1.75E-01	3.20E+00	5.47E-02	8.47E-01	9.75E-02	8.33E-03	3.35E-02	1.42E-02
2	MACT	CINC_ALL	OINC_L	PB	-1.25E-02	3.31E+00	-3.77E-03	9.00E-01	7.08E-02	2.67E-02	8.33E-04	1.67E-03
3	MACT	CINC_ALL	OINC_L	AS	2.50E-02	3.43E+00	7.30E-03	8.74E-01	7.08E-02	1.42E-02	3.92E-02	1.67E-03
4	MACT	CINC_ALL	OINC_L	BE	3.75E-02	3.16E+00	1.19E-02	8.50E-01	8.08E-02	2.67E-02	4.04E-02	1.67E-03
5	MACT	CINC_ALL	OINC_L	CD	2.50E-02	3.43E+00	7.30E-03	8.83E-01	7.08E-02	1.42E-02	3.04E-02	1.67E-03
6	MACT	CINC_ALL	OINC_L	CL2	2.50E-02	3.43E+00	7.30E-03	8.57E-01	7.08E-02	1.42E-02	5.68E-02	1.67E-03
7	MACT	CINC_ALL	OINC_L	CR_6	-1.09E-01	3.15E+00	-3.48E-02	6.97E-01	7.08E-02	1.39E-01	6.63E-02	2.67E-02
8	MACT	CINC_ALL	OINC_L	HCL	-2.50E-02	3.28E+00	-7.63E-03	8.11E-01	7.08E-02	2.42E-02	9.28E-02	1.67E-03
9	MACT	CINC_ALL	OINC_L	HG	-5.00E-02	3.20E+00	-1.56E-02	8.58E-01	7.08E-02	3.92E-02	3.04E-02	1.67E-03
10	MACT	CINC_ALL	OINC_S	TEQ	2.81E-02	3.15E+00	8.92E-03	6.45E-01	1.33E-01	1.25E-01	3.85E-02	5.81E-02
11	MACT	CINC_ALL	OINC_S	PB	2.50E-02	2.81E+00	8.89E-03	6.89E-01	1.46E-01	1.31E-01	3.31E-02	1.67E-03
12	MACT	CINC_ALL	OINC_S	AS	-1.25E-02	2.93E+00	-4.27E-03	6.83E-01	1.33E-01	1.31E-01	5.10E-02	1.67E-03
13	MACT	CINC_ALL	OINC_S	BE	2.79E-09	2.91E+00	9.59E-10	6.61E-01	1.43E-01	1.43E-01	5.08E-02	1.67E-03
14	MACT	CINC_ALL	OINC_S	CD	-1.25E-02	2.93E+00	-4.27E-03	6.92E-01	1.33E-01	1.31E-01	4.21E-02	1.67E-03
15	MACT	CINC_ALL	OINC_S	CL2	-1.38E-01	3.28E+00	-4.19E-02	7.70E-01	8.33E-03	1.31E-01	4.21E-02	4.92E-02
16	MACT	CINC_ALL	OINC_S	CR_6	-1.41E-01	3.23E+00	-4.35E-02	6.67E-01	8.33E-03	1.31E-01	4.21E-02	1.52E-01
17	MACT	CINC_ALL	OINC_S	HCL	6.25E-02	2.83E+00	2.21E-02	6.49E-01	1.58E-01	1.31E-01	5.99E-02	1.67E-03
18	MACT	CINC_ALL	OINC_S	HG	-8.75E-02	2.70E+00	-3.24E-02	6.67E-01	1.33E-01	1.56E-01	4.21E-02	1.67E-03
19	MACT	OINC_L	CINC_ALL	TEQ	-1.75E-01	3.05E+00	-5.74E-02	8.47E-01	8.33E-03	9.75E-02	3.35E-02	1.42E-02
20	MACT	OINC_L	CINC_ALL	PB	1.25E-02	3.16E+00	3.95E-03	9.00E-01	2.67E-02	7.08E-02	8.33E-04	1.67E-03
21	MACT	OINC_L	CINC_ALL	AS	-2.50E-02	3.28E+00	-7.63E-03	8.74E-01	1.42E-02	7.08E-02	3.92E-02	1.67E-03
22	MACT	OINC_L	CINC_ALL	BE	-3.75E-02	3.01E+00	-1.24E-02	8.50E-01	2.67E-02	8.08E-02	4.04E-02	1.67E-03
23	MACT	OINC_L	CINC_ALL	CD	-2.50E-02	3.28E+00	-7.63E-03	8.83E-01	1.42E-02	7.08E-02	3.04E-02	1.67E-03
24	MACT	OINC_L	CINC_ALL	CL2	-2.50E-02	3.28E+00	-7.63E-03	8.57E-01	1.42E-02	7.08E-02	5.68E-02	1.67E-03
25	MACT	OINC_L	CINC_ALL	CR_6	1.09E-01	3.00E+00	3.65E-02	6.97E-01	1.39E-01	7.08E-02	6.63E-02	2.67E-02
26	MACT	OINC_L	CINC_ALL	HCL	2.50E-02	3.13E+00	8.00E-03	8.11E-01	2.42E-02	7.08E-02	9.28E-02	1.67E-03
27	MACT	OINC_L	CINC_ALL	HG	5.00E-02	3.05E+00	1.64E-02	8.58E-01	3.92E-02	7.08E-02	3.04E-02	1.67E-03

(continued)

Table 6-3a. (continued)

Run No.	MACT Option	P1 Category	P2 Category	Chemical	Grand Score	Grand Score Reliability	GS/GS Reliability	Count Zero	Count +1	Count -1	Count 888	Count 999
28	MACT	OINC_L	OINC_S	TEQ	-4.06E-02	2.47E+00	-1.65E-02	6.42E-01	1.25E-01	1.31E-01	4.38E-02	5.81E-02
29	MACT	OINC_L	OINC_S	PB	1.00E-01	2.24E+00	4.47E-02	6.98E-01	1.52E-01	1.25E-01	2.33E-02	1.67E-03
30	MACT	OINC_L	OINC_S	AS	1.25E-01	2.23E+00	5.62E-02	6.43E-01	2.02E-01	1.25E-01	2.92E-02	1.67E-03
31	MACT	OINC_L	OINC_S	BE	1.63E-01	2.11E+00	7.69E-02	6.30E-01	2.14E-01	1.25E-01	2.92E-02	1.67E-03
32	MACT	OINC_L	OINC_S	CD	1.63E-01	2.11E+00	7.69E-02	6.12E-01	2.14E-01	1.25E-01	4.69E-02	1.67E-03
33	MACT	OINC_L	OINC_S	CL2	-1.16E-01	2.18E+00	-5.29E-02	5.95E-01	7.67E-02	2.50E-01	2.92E-02	4.92E-02
34	MACT	OINC_L	OINC_S	CR_6	1.56E-02	2.48E+00	6.29E-03	6.18E-01	7.67E-02	1.25E-01	2.92E-02	1.52E-01
35	MACT	OINC_L	OINC_S	HCL	2.00E-01	2.13E+00	9.41E-02	5.64E-01	2.27E-01	1.25E-01	8.25E-02	1.67E-03
36	MACT	OINC_L	OINC_S	HG	1.25E-01	2.23E+00	5.62E-02	6.34E-01	2.02E-01	1.25E-01	3.79E-02	1.67E-03
37	MACT	OINC_S	CINC_ALL	TEQ	-2.81E-02	2.78E+00	-1.01E-02	6.45E-01	1.25E-01	1.33E-01	3.85E-02	5.81E-02
38	MACT	OINC_S	CINC_ALL	PB	-2.50E-02	2.56E+00	-9.76E-03	6.89E-01	1.31E-01	1.46E-01	3.31E-02	1.67E-03
39	MACT	OINC_S	CINC_ALL	AS	1.25E-02	2.68E+00	4.67E-03	6.83E-01	1.31E-01	1.33E-01	5.10E-02	1.67E-03
40	MACT	OINC_S	CINC_ALL	BE	-2.79E-09	2.66E+00	-1.05E-09	6.61E-01	1.43E-01	1.43E-01	5.08E-02	1.67E-03
41	MACT	OINC_S	CINC_ALL	CD	1.25E-02	2.68E+00	4.67E-03	6.92E-01	1.31E-01	1.33E-01	4.21E-02	1.67E-03
42	MACT	OINC_S	CINC_ALL	CL2	1.38E-01	2.99E+00	4.59E-02	7.70E-01	1.31E-01	8.33E-03	4.21E-02	4.92E-02
43	MACT	OINC_S	CINC_ALL	CR_6	1.41E-01	2.92E+00	4.81E-02	6.67E-01	1.31E-01	8.33E-03	4.21E-02	1.52E-01
44	MACT	OINC_S	CINC_ALL	HCL	-6.25E-02	2.33E+00	-2.69E-02	6.49E-01	1.31E-01	1.58E-01	5.99E-02	1.67E-03
45	MACT	OINC_S	CINC_ALL	HG	8.75E-02	2.45E+00	3.57E-02	6.67E-01	1.56E-01	1.33E-01	4.21E-02	1.67E-03
46	MACT	OINC_S	OINC_L	TEQ	4.06E-02	2.26E+00	1.80E-02	6.42E-01	1.31E-01	1.25E-01	4.38E-02	5.81E-02
47	MACT	OINC_S	OINC_L	PB	-1.00E-01	2.11E+00	-4.73E-02	6.98E-01	1.25E-01	1.52E-01	2.33E-02	1.67E-03
48	MACT	OINC_S	OINC_L	AS	-1.25E-01	2.10E+00	-5.95E-02	6.43E-01	1.25E-01	2.02E-01	2.92E-02	1.67E-03
49	MACT	OINC_S	OINC_L	BE	-1.63E-01	1.99E+00	-8.18E-02	6.30E-01	1.25E-01	2.14E-01	2.92E-02	1.67E-03
50	MACT	OINC_S	OINC_L	CD	-1.63E-01	1.99E+00	-8.18E-02	6.12E-01	1.25E-01	2.14E-01	4.69E-02	1.67E-03
51	MACT	OINC_S	OINC_L	CL2	1.16E-01	2.04E+00	5.67E-02	5.95E-01	2.50E-01	7.67E-02	2.92E-02	4.92E-02
52	MACT	OINC_S	OINC_L	CR_6	-1.56E-02	2.33E+00	-6.71E-03	6.18E-01	1.25E-01	7.67E-02	2.92E-02	1.52E-01
53	MACT	OINC_S	OINC_L	HCL	-2.00E-01	1.75E+00	-1.14E-01	5.64E-01	1.25E-01	2.27E-01	8.25E-02	1.67E-03
54	MACT	OINC_S	OINC_L	HG	-1.25E-01	2.10E+00	-5.95E-02	6.34E-01	1.25E-01	2.02E-01	3.79E-02	1.67E-03
55	BLINE	CINC_ALL	OINC_L	TEQ	2.00E-01	3.13E+00	6.40E-02	8.55E-01	1.10E-01	8.33E-03	2.46E-02	1.67E-03

(continued)

Table 6-3a. (continued)

Run No.	MACT Option	P1 Category	P2 Category	Chemical	Grand Score	Grand Score Reliability	GS/GS Reliability	Count Zero	Count +1	Count -1	Count 888	Count 999
56	BLINE	CINC_ALL	OINC_L	PB	-1.00E-01	3.05E+00	-3.28E-02	7.88E-01	7.08E-02	1.39E-01	8.33E-04	1.67E-03
57	BLINE	CINC_ALL	OINC_L	AS	2.50E-02	3.43E+00	7.30E-03	8.83E-01	7.08E-02	1.42E-02	3.04E-02	1.67E-03
58	BLINE	CINC_ALL	OINC_L	BE	-1.00E-01	3.05E+00	-3.28E-02	7.58E-01	7.08E-02	1.39E-01	3.04E-02	1.67E-03
59	BLINE	CINC_ALL	OINC_L	CD	2.50E-02	3.43E+00	7.30E-03	8.83E-01	7.08E-02	1.42E-02	3.04E-02	1.67E-03
60	BLINE	CINC_ALL	OINC_L	CL2	2.50E-02	3.43E+00	7.30E-03	8.57E-01	7.08E-02	1.42E-02	5.68E-02	1.67E-03
61	BLINE	CINC_ALL	OINC_L	CR_6	-1.09E-01	3.15E+00	-3.48E-02	7.06E-01	7.08E-02	1.39E-01	5.71E-02	2.67E-02
62	BLINE	CINC_ALL	OINC_L	HCL	-2.50E-02	3.28E+00	-7.63E-03	8.02E-01	7.08E-02	2.42E-02	1.02E-01	1.67E-03
63	BLINE	CINC_ALL	OINC_L	HG	-1.25E-02	3.31E+00	-3.77E-03	8.70E-01	7.08E-02	2.67E-02	3.04E-02	1.67E-03
64	BLINE	CINC_ALL	OINC_S	TEQ	2.81E-02	3.28E+00	8.58E-03	6.45E-01	1.33E-01	1.25E-01	4.74E-02	4.92E-02
65	BLINE	CINC_ALL	OINC_S	PB	2.50E-02	2.81E+00	8.89E-03	6.89E-01	1.46E-01	1.31E-01	3.31E-02	1.67E-03
66	BLINE	CINC_ALL	OINC_S	AS	-1.25E-02	2.93E+00	-4.27E-03	6.83E-01	1.33E-01	1.31E-01	5.10E-02	1.67E-03
67	BLINE	CINC_ALL	OINC_S	BE	2.79E-09	2.66E+00	1.05E-09	6.61E-01	1.43E-01	1.43E-01	5.08E-02	1.67E-03
68	BLINE	CINC_ALL	OINC_S	CD	-1.25E-02	3.18E+00	-3.94E-03	6.92E-01	1.33E-01	1.31E-01	4.21E-02	1.67E-03
69	BLINE	CINC_ALL	OINC_S	CL2	-2.63E-01	2.91E+00	-9.03E-02	6.45E-01	8.33E-03	2.56E-01	4.21E-02	4.92E-02
70	BLINE	CINC_ALL	OINC_S	CR_6	-1.41E-01	3.23E+00	-4.35E-02	6.67E-01	8.33E-03	1.31E-01	4.21E-02	1.52E-01
71	BLINE	CINC_ALL	OINC_S	HCL	-6.25E-02	3.08E+00	-2.03E-02	7.74E-01	3.33E-02	1.31E-01	5.99E-02	1.67E-03
72	BLINE	CINC_ALL	OINC_S	HG	-1.25E-02	2.93E+00	-4.27E-03	6.92E-01	1.33E-01	1.31E-01	4.21E-02	1.67E-03
73	BLINE	OINC_L	CINC_ALL	TEQ	-2.00E-01	2.98E+00	-6.72E-02	8.55E-01	8.33E-03	1.10E-01	2.46E-02	1.67E-03
74	BLINE	OINC_L	CINC_ALL	PB	1.00E-01	2.90E+00	3.45E-02	7.88E-01	1.39E-01	7.08E-02	8.33E-04	1.67E-03
75	BLINE	OINC_L	CINC_ALL	AS	-2.50E-02	3.28E+00	-7.63E-03	8.83E-01	1.42E-02	7.08E-02	3.04E-02	1.67E-03
76	BLINE	OINC_L	CINC_ALL	BE	1.00E-01	2.90E+00	3.45E-02	7.58E-01	1.39E-01	7.08E-02	3.04E-02	1.67E-03
77	BLINE	OINC_L	CINC_ALL	CD	-2.50E-02	3.28E+00	-7.63E-03	8.83E-01	1.42E-02	7.08E-02	3.04E-02	1.67E-03
78	BLINE	OINC_L	CINC_ALL	CL2	-2.50E-02	3.28E+00	-7.63E-03	8.57E-01	1.42E-02	7.08E-02	5.68E-02	1.67E-03
79	BLINE	OINC_L	CINC_ALL	CR_6	1.09E-01	3.00E+00	3.65E-02	7.06E-01	1.39E-01	7.08E-02	5.71E-02	2.67E-02
80	BLINE	OINC_L	CINC_ALL	HCL	2.50E-02	3.13E+00	8.00E-03	8.02E-01	2.42E-02	7.08E-02	1.02E-01	1.67E-03
81	BLINE	OINC_L	CINC_ALL	HG	1.25E-02	3.16E+00	3.95E-03	8.70E-01	2.67E-02	7.08E-02	3.04E-02	1.67E-03
82	BLINE	OINC_L	OINC_S	TEQ	-4.06E-02	2.59E+00	-1.57E-02	6.51E-01	1.25E-01	1.31E-01	4.38E-02	4.92E-02
83	BLINE	OINC_L	OINC_S	PB	1.00E-01	2.24E+00	4.47E-02	6.98E-01	1.52E-01	1.25E-01	2.33E-02	1.67E-03

(continued)

Table 6-3a. (continued)

Run No.	MACT Option	P1 Category	P2 Category	Chemical	Grand Score	Grand Score Reliability	GS/GS Reliability	Count Zero	Count +1	Count -1	Count 888	Count 999
84	BLINE	OINC_L	OINC_S	AS	1.25E-01	2.23E+00	5.62E-02	6.34E-01	2.02E-01	1.25E-01	3.81E-02	1.67E-03
85	BLINE	OINC_L	OINC_S	BE	1.25E-01	2.00E+00	6.25E-02	6.17E-01	2.14E-01	1.38E-01	2.92E-02	1.67E-03
86	BLINE	OINC_L	OINC_S	CD	1.63E-01	2.11E+00	7.69E-02	6.12E-01	2.14E-01	1.25E-01	4.69E-02	1.67E-03
87	BLINE	OINC_L	OINC_S	CL2	-1.16E-01	2.18E+00	-5.29E-02	5.95E-01	7.67E-02	2.50E-01	2.92E-02	4.92E-02
88	BLINE	OINC_L	OINC_S	CR_6	1.56E-02	2.48E+00	6.29E-03	6.18E-01	7.67E-02	1.25E-01	2.92E-02	1.52E-01
89	BLINE	OINC_L	OINC_S	HCL	7.50E-02	2.38E+00	3.16E-02	6.98E-01	1.02E-01	1.25E-01	7.38E-02	1.67E-03
90	BLINE	OINC_L	OINC_S	HG	1.63E-01	2.11E+00	7.69E-02	6.11E-01	2.14E-01	1.25E-01	4.79E-02	1.67E-03
91	BLINE	OINC_S	CINC_ALL	TEQ	-2.81E-02	2.91E+00	-9.67E-03	6.45E-01	1.25E-01	1.33E-01	4.74E-02	4.92E-02
92	BLINE	OINC_S	CINC_ALL	PB	-2.50E-02	2.56E+00	-9.76E-03	6.89E-01	1.31E-01	1.46E-01	3.31E-02	1.67E-03
93	BLINE	OINC_S	CINC_ALL	AS	1.25E-02	2.68E+00	4.67E-03	6.83E-01	1.31E-01	1.33E-01	5.10E-02	1.67E-03
94	BLINE	OINC_S	CINC_ALL	BE	-2.79E-09	2.41E+00	-1.16E-09	6.61E-01	1.43E-01	1.43E-01	5.08E-02	1.67E-03
95	BLINE	OINC_S	CINC_ALL	CD	1.25E-02	2.93E+00	4.27E-03	6.92E-01	1.31E-01	1.33E-01	4.21E-02	1.67E-03
96	BLINE	OINC_S	CINC_ALL	CL2	2.63E-01	2.62E+00	1.00E-01	6.45E-01	2.56E-01	8.33E-03	4.21E-02	4.92E-02
97	BLINE	OINC_S	CINC_ALL	CR_6	1.41E-01	2.92E+00	4.81E-02	6.67E-01	1.31E-01	8.33E-03	4.21E-02	1.52E-01
98	BLINE	OINC_S	CINC_ALL	HCL	6.25E-02	2.58E+00	2.43E-02	7.74E-01	1.31E-01	3.33E-02	5.99E-02	1.67E-03
99	BLINE	OINC_S	CINC_ALL	HG	1.25E-02	2.68E+00	4.67E-03	6.92E-01	1.31E-01	1.33E-01	4.21E-02	1.67E-03
100	BLINE	OINC_S	OINC_L	TEQ	4.06E-02	2.38E+00	1.70E-02	6.51E-01	1.31E-01	1.25E-01	4.38E-02	4.92E-02
101	BLINE	OINC_S	OINC_L	PB	-1.00E-01	2.11E+00	-4.73E-02	6.98E-01	1.25E-01	1.52E-01	2.33E-02	1.67E-03
102	BLINE	OINC_S	OINC_L	AS	-1.25E-01	2.10E+00	-5.95E-02	6.34E-01	1.25E-01	2.02E-01	3.81E-02	1.67E-03
103	BLINE	OINC_S	OINC_L	BE	-1.25E-01	1.88E+00	-6.67E-02	6.17E-01	1.38E-01	2.14E-01	2.92E-02	1.67E-03
104	BLINE	OINC_S	OINC_L	CD	-1.63E-01	1.99E+00	-8.18E-02	6.12E-01	1.25E-01	2.14E-01	4.69E-02	1.67E-03
105	BLINE	OINC_S	OINC_L	CL2	1.16E-01	2.04E+00	5.67E-02	5.95E-01	2.50E-01	7.67E-02	2.92E-02	4.92E-02
106	BLINE	OINC_S	OINC_L	CR_6	-1.56E-02	2.33E+00	-6.71E-03	6.18E-01	1.25E-01	7.67E-02	2.92E-02	1.52E-01
107	BLINE	OINC_S	OINC_L	HCL	-7.50E-02	2.00E+00	-3.75E-02	6.98E-01	1.25E-01	1.02E-01	7.38E-02	1.67E-03
108	BLINE	OINC_S	OINC_L	HG	-1.63E-01	1.99E+00	-8.18E-02	6.11E-01	1.25E-01	2.14E-01	4.79E-02	1.67E-03

Table 6-3b. RelRisk Outputs for Cross-Validation Analysis (Part 2 of 3)

	Predicted P2 MOEs			True P2 MOEs			Predicted P2 MOE/True P2 MOE		
Run No.	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**
1	3.509778	1.403911	0.561565	5	3	1.7	-1.42459	-2.13689	-3.02726
2	428.3438	428.3438	257.0063	1000	1000	1000	-2.33457	-2.33457	-3.89096
3	361.4758	361.4758	144.5903	500	500	500	-1.38322	-1.38322	-3.45805
4	33292.42	16646.21	1664.621	10000	10000	5000	3.329242	1.664621	-3.00369
5	5781.833	1734.55	578.1832	1000	1000	1000	5.781833	1.73455	-1.72956
6	37.02803	12.34268	6.171339	40	20	10	-1.08026	-1.62039	-1.62039
7	426.474	426.474	127.9422	500	300	200	-1.1724	1.42158	-1.56321
8	962.8603	962.8603	481.4301	1000	1000	300	-1.03857	-1.03857	1.604767
9	1235.657	247.1314	123.5657	500	200	100	2.471314	1.235657	1.235657
10	137.1079	54.84317	21.93727	10	8	2	13.71079	6.855396	10.96864
11	18804.11	18804.11	11282.47	1000	1000	1000	18.80411	18.80411	11.28247
12	24930.53	24930.53	9972.212	10000	10000	3000	2.493053	2.493053	3.324071
13	211087.3	105543.7	10554.37	300000	200000	100000	-1.42121	-1.89495	-9.47475
14	92307.35	27692.21	9230.735	50000	30000	10000	1.846147	-1.08334	-1.08334
15	6.211793	2.070598	1.035299	60	40	10	-9.65905	-19.3181	-9.65905
16	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	3000	1000	200	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
17	5680.11	5680.11	2840.055	3000	2000	500	1.89337	2.840055	5.68011
18	7164.715	1432.943	716.4716	200	100	50	35.82358	14.32943	14.32943
19	7.122957	4.273774	2.421805	5	2	0.8	1.424591	2.136887	3.027256
20	1167.287	1167.287	1167.287	500	500	300	2.334574	2.334574	3.890957
21	691.6093	691.6093	691.6093	500	500	200	1.383219	1.383219	3.458047
22	60073.74	60073.74	30036.87	200000	100000	10000	-3.32924	-1.66462	3.003687
23	1729.556	1729.556	1729.556	10000	3000	1000	-5.78183	-1.73455	1.729556
24	32.40788	16.20394	8.101969	30	10	5	1.080263	1.620394	1.620394
25	11724.04	7034.427	4689.618	10000	10000	3000	1.172404	-1.42158	1.563206

(continued)

Table 6-3b. (continued)

	Predicted P2 MOEs			True P2 MOEs			Predicted P2 MOE/True P2 MOE		
Run No.	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**
26	1038.572	1038.572	311.5717	1000	1000	500	1.038572	1.038572	-1.60477
27	404.6431	161.8572	80.92862	1000	200	100	-2.47131	-1.23566	-1.23566
28	143.8778	86.32671	48.91846	10	8	2	14.38778	10.79084	24.45923
29	22741.52	22741.52	22741.52	1000	1000	1000	22.74152	22.74152	22.74152
30	14547.15	14547.15	14547.15	10000	10000	3000	1.454715	1.454715	4.84905
31	43512.4	43512.4	21756.2	300000	200000	100000	-6.89459	-4.59639	-4.59639
32	15706.5	15706.5	15706.5	50000	30000	10000	-3.1834	-1.91004	1.57065
33	6.710368	3.355184	1.677592	60	40	10	-8.94139	-11.9218	-5.96092
34	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	3000	1000	200	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
35	3086.028	3086.028	925.8084	3000	2000	500	1.028676	1.543014	1.851617
36	3403.578	1361.431	680.7156	200	100	50	17.01789	13.61431	13.61431
37	0.364676	0.291741	0.072935	5	2	0.8	-13.7108	-6.8554	-10.9686
38	26.58993	26.58993	26.58993	500	500	300	-18.8041	-18.8041	-11.2825
39	200.5573	200.5573	60.16719	500	500	200	-2.49305	-2.49305	-3.32407
40	284242.5	189495	94747.51	200000	100000	10000	1.421213	1.89495	9.474751
41	5416.687	3250.012	1083.337	10000	3000	1000	-1.84615	1.083337	1.083337
42	289.7714	193.1809	48.29523	30	10	5	9.659047	19.31809	9.659046
43	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	10000	10000	3000	Insufficient Data for MOE	Insufficient Data for MOE	
44	528.1588	352.1058	88.02646	1000	1000	500	-1.89337	-2.84006	-5.68011
45	27.91458	13.95729	6.978644	1000	200	100	-35.8236	-14.3294	-14.3294
46	0.347517	0.278014	0.069503	5	3	1.7	-14.3878	-10.7908	-24.4592
47	43.97243	43.97243	43.97243	1000	1000	1000	-22.7415	-22.7415	-22.7415
48	343.7099	343.7099	103.113	500	500	500	-1.45472	-1.45472	-4.84905
49	68945.87	45963.91	22981.96	10000	10000	5000	6.894587	4.596391	4.596392
50	3183.396	1910.037	636.6791	1000	1000	1000	3.183396	1.910037	-1.57065
51	357.6555	238.437	59.60925	40	20	10	8.941388	11.92185	5.960925

(continued)

Table 6-3b. (continued)

Run No.	Predicted P2 MOEs			True P2 MOEs			Predicted P2 MOE/True P2 MOE		
	90th %	95th %	99th %	90th %	95th %	99th %	90th %	95th %	99th %
52	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	500	300	200	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
53	972.1234	648.0822	162.0206	1000	1000	300	-1.02868	-1.54301	-1.85162
54	29.38084	14.69042	7.345211	500	200	100	-17.0179	-13.6143	-13.6143
55	0.257495	0.128747	0.034333	1.7	0.8	0.2	-6.60208	-6.21372	-5.82537
56	15.81328	13.55424	9.036158	10	10	8	1.581328	1.355424	1.12952
57	48.57341	24.28671	4.857341	30	20	10	1.619114	1.214336	-2.05874
58	4877.817	1951.127	487.7817	5000	5000	2000	-1.02505	-2.56262	-4.10019
59	284.3477	142.1739	56.86955	50	50	20	5.686954	2.843478	2.843478
60	25.0886	7.526579	2.50886	20	20	4	1.25443	-2.65725	-1.59435
61	5.019455	1.673152	0.836576	100	50	20	-19.9225	-29.8837	-23.907
62	908.5349	908.5349	454.2675	200	100	100	4.542675	9.085349	4.542675
63	227.9144	227.9144	113.9572	500	200	100	-2.19381	1.139572	1.139572
64	2.287249	1.143624	0.304967	1.7	0.8	0.2	1.345441	1.42953	1.524833
65	5863.018	5025.443	3350.296	1000	1000	1000	5.863018	5.025443	3.350296
66	8284.003	4142.001	828.4003	5000	2000	1000	1.656801	2.071001	-1.20715
67	436464.5	174585.8	43646.45	200000	100000	100000	2.182323	1.745858	-2.29114
68	20464.38	10232.19	4092.875	20000	10000	10000	1.023219	1.023219	-2.44327
69	11.68357	3.50507	1.168357	20	10	6	-1.71181	-2.85301	-5.13542
70	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	1000	1000	500	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
71	1889.767	1889.767	944.8834	1000	500	100	1.889767	3.779534	9.448834
72	3483.29	3483.29	1741.645	200	100	50	17.41645	34.8329	34.8329
73	3.961249	1.864117	0.466029	0.6	0.3	0.08	6.602082	6.213723	5.825365
74	44.2666	44.2666	35.41328	70	60	40	-1.58133	-1.35542	-1.12952
75	123.5244	82.34958	41.17479	200	100	20	-1.61911	-1.21434	2.05874
76	51252.43	51252.43	20500.97	50000	20000	5000	1.025049	2.562622	4.100194
77	175.841	175.841	70.33641	1000	500	200	-5.68696	-2.84348	-2.84348

(continued)

Table 6-3b. (continued)

	Predicted P2 MOEs			True P2 MOEs			Predicted P2 MOE/True P2 MOE		
Run No.	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**
78	15.9435	15.9435	3.188699	20	6	2	-1.25443	2.65725	1.59435
79	59767.44	29883.72	11953.49	3000	1000	500	19.92248	29.88372	23.90698
80	220.1346	110.0673	110.0673	1000	1000	500	-4.54268	-9.08535	-4.54268
81	219.3806	87.75223	43.87611	100	100	50	2.193806	-1.13957	-1.13957
82	15.1006	7.106165	1.776541	1.7	0.8	0.2	8.882706	8.882706	8.882705
83	3707.655	3707.655	2966.124	1000	1000	1000	3.707655	3.707655	2.966124
84	34030.68	22687.12	11343.56	5000	2000	1000	6.806136	11.34356	11.34356
85	447397.3	447397.3	178958.9	200000	100000	100000	2.236987	4.473973	1.789589
86	4993.743	4993.743	1997.497	20000	10000	10000	-4.00501	-2.00251	-5.00627
87	1.759077	1.759077	0.351815	20	10	6	-11.3696	-5.6848	-17.0544
88	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	1000	1000	500	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
89	416.0031	208.0016	208.0016	1000	500	100	-2.40383	-2.40383	2.080016
90	12357.94	4943.177	2471.589	200	100	50	61.7897	49.43177	49.43178
91	0.445951	0.209859	0.052465	0.6	0.3	0.08	-1.34544	-1.42953	-1.52483
92	11.93925	11.93925	11.93925	70	60	40	-5.86301	-5.02544	-3.35029
93	120.7146	48.28584	24.14292	200	100	20	-1.6568	-2.071	1.207146
94	22911.37	11455.69	11455.69	50000	20000	5000	-2.18232	-1.74586	2.291138
95	977.3082	488.6541	488.6541	1000	500	200	-1.02322	-1.02322	2.443271
96	34.23612	17.11806	10.27084	20	6	2	1.711806	2.85301	5.13542
97	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	3000	1000	500	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
98	529.1658	264.5829	52.91658	1000	1000	500	-1.88977	-3.77953	-9.44883
99	5.741698	2.870849	1.435424	100	100	50	-17.4165	-34.8329	-34.8329
100	0.191383	0.090063	0.022516	1.7	0.8	0.2	-8.88271	-8.88271	-8.88271
101	2.697123	2.697123	2.697123	10	10	8	-3.70765	-3.70765	-2.96612
102	4.407787	1.763115	0.881557	30	20	10	-6.80614	-11.3436	-11.3436
103	2235.15	1117.575	1117.575	5000	5000	2000	-2.23699	-4.47397	-1.78959

(continued)

Table 6-3b. (continued)

Run No.	Predicted P2 MOEs			True P2 MOEs			Predicted P2 MOE/True P2 MOE		
	90th %	95th %	99th %	90th %	95th %	99th %	90th %	95th %	99th %
104	200.2506	100.1253	100.1253	50	50	20	4.005012	2.002506	5.006265
105	227.392	113.696	68.21761	20	20	4	11.3696	5.6848	17.0544
106	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE	100	50	20	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
107	480.7656	240.3828	48.07656	200	100	100	2.403828	2.403828	-2.08002
108	8.091962	4.045981	2.02299	500	200	100	-61.7897	-49.4318	-49.4318
						Avg:	-2E-07	9.83E-09	-7.2E-08
						Median:	1.63E-07	1.63E-07	-1.8E-07
						StdDev:	12.812	11.93619	11.99637

Table 6-3c. RelRisk Outputs for Cross-Validation Analysis (Part 3 of 3)

	True P1 MOEs			True P2/P1 MOE Ratio			Predicted P2/True P1 MOE Ratio		
Run No.	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**
1	5.00E+00	2.00E+00	8.00E-01	1.00E+00	1.50E+00	2.13E+00	7.02E-01	7.02E-01	7.02E-01
2	5.00E+02	5.00E+02	3.00E+02	2.00E+00	2.00E+00	3.33E+00	8.57E-01	8.57E-01	8.57E-01
3	5.00E+02	5.00E+02	2.00E+02	1.00E+00	1.00E+00	2.50E+00	7.23E-01	7.23E-01	7.23E-01
4	2.00E+05	1.00E+05	1.00E+04	5.00E-02	1.00E-01	5.00E-01	1.66E-01	1.66E-01	1.66E-01
5	1.00E+04	3.00E+03	1.00E+03	1.00E-01	3.33E-01	1.00E+00	5.78E-01	5.78E-01	5.78E-01
6	3.00E+01	1.00E+01	5.00E+00	1.33E+00	2.00E+00	2.00E+00	1.23E+00	1.23E+00	1.23E+00
7	1.00E+04	1.00E+04	3.00E+03	5.00E-02	3.00E-02	6.67E-02	4.26E-02	4.26E-02	4.26E-02
8	1.00E+03	1.00E+03	5.00E+02	1.00E+00	1.00E+00	6.00E-01	9.63E-01	9.63E-01	9.63E-01
9	1.00E+03	2.00E+02	1.00E+02	5.00E-01	1.00E+00	1.00E+00	1.24E+00	1.24E+00	1.24E+00
10	5.00E+00	2.00E+00	8.00E-01	2.00E+00	4.00E+00	2.50E+00	2.74E+01	2.74E+01	2.74E+01
11	5.00E+02	5.00E+02	3.00E+02	2.00E+00	2.00E+00	3.33E+00	3.76E+01	3.76E+01	3.76E+01
12	5.00E+02	5.00E+02	2.00E+02	2.00E+01	2.00E+01	1.50E+01	4.99E+01	4.99E+01	4.99E+01
13	2.00E+05	1.00E+05	1.00E+04	1.50E+00	2.00E+00	1.00E+01	1.06E+00	1.06E+00	1.06E+00
14	1.00E+04	3.00E+03	1.00E+03	5.00E+00	1.00E+01	1.00E+01	9.23E+00	9.23E+00	9.23E+00
15	3.00E+01	1.00E+01	5.00E+00	2.00E+00	4.00E+00	2.00E+00	2.07E-01	2.07E-01	2.07E-01
16	1.00E+04	1.00E+04	3.00E+03	3.00E-01	1.00E-01	6.67E-02	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
17	1.00E+03	1.00E+03	5.00E+02	3.00E+00	2.00E+00	1.00E+00	5.68E+00	5.68E+00	5.68E+00
18	1.00E+03	2.00E+02	1.00E+02	2.00E-01	5.00E-01	5.00E-01	7.16E+00	7.16E+00	7.16E+00
19	5.00E+00	3.00E+00	1.70E+00	1.00E+00	6.67E-01	4.71E-01	1.42E+00	1.42E+00	1.42E+00
20	1.00E+03	1.00E+03	1.00E+03	5.00E-01	5.00E-01	3.00E-01	1.17E+00	1.17E+00	1.17E+00
21	5.00E+02	5.00E+02	5.00E+02	1.00E+00	1.00E+00	4.00E-01	1.38E+00	1.38E+00	1.38E+00
22	1.00E+04	1.00E+04	5.00E+03	2.00E+01	1.00E+01	2.00E+00	6.01E+00	6.01E+00	6.01E+00
23	1.00E+03	1.00E+03	1.00E+03	1.00E+01	3.00E+00	1.00E+00	1.73E+00	1.73E+00	1.73E+00
24	4.00E+01	2.00E+01	1.00E+01	7.50E-01	5.00E-01	5.00E-01	8.10E-01	8.10E-01	8.10E-01
25	5.00E+02	3.00E+02	2.00E+02	2.00E+01	3.33E+01	1.50E+01	2.34E+01	2.34E+01	2.34E+01

(continued)

Table 6-3c. (continued)

Run No.	True P1 MOEs			True P2/P1 MOE Ratio			Predicted P2/True P1 MOE Ratio		
	90th %	95th %	99th %	90th %	95th %	99th %	90th %	95th %	99th %
26	1.00E+03	1.00E+03	3.00E+02	1.00E+00	1.00E+00	1.67E+00	1.04E+00	1.04E+00	1.04E+00
27	5.00E+02	2.00E+02	1.00E+02	2.00E+00	1.00E+00	1.00E+00	8.09E-01	8.09E-01	8.09E-01
28	5.00E+00	3.00E+00	1.70E+00	2.00E+00	2.67E+00	1.18E+00	2.88E+01	2.88E+01	2.88E+01
29	1.00E+03	1.00E+03	1.00E+03	1.00E+00	1.00E+00	1.00E+00	2.27E+01	2.27E+01	2.27E+01
30	5.00E+02	5.00E+02	5.00E+02	2.00E+01	2.00E+01	6.00E+00	2.91E+01	2.91E+01	2.91E+01
31	1.00E+04	1.00E+04	5.00E+03	3.00E+01	2.00E+01	2.00E+01	4.35E+00	4.35E+00	4.35E+00
32	1.00E+03	1.00E+03	1.00E+03	5.00E+01	3.00E+01	1.00E+01	1.57E+01	1.57E+01	1.57E+01
33	4.00E+01	2.00E+01	1.00E+01	1.50E+00	2.00E+00	1.00E+00	1.68E-01	1.68E-01	1.68E-01
34	5.00E+02	3.00E+02	2.00E+02	6.00E+00	3.33E+00	1.00E+00	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
35	1.00E+03	1.00E+03	3.00E+02	3.00E+00	2.00E+00	1.67E+00	3.09E+00	3.09E+00	3.09E+00
36	5.00E+02	2.00E+02	1.00E+02	4.00E-01	5.00E-01	5.00E-01	6.81E+00	6.81E+00	6.81E+00
37	1.00E+01	8.00E+00	2.00E+00	5.00E-01	2.50E-01	4.00E-01	3.65E-02	3.65E-02	3.65E-02
38	1.00E+03	1.00E+03	1.00E+03	5.00E-01	5.00E-01	3.00E-01	2.66E-02	2.66E-02	2.66E-02
39	1.00E+04	1.00E+04	3.00E+03	5.00E-02	5.00E-02	6.67E-02	2.01E-02	2.01E-02	2.01E-02
40	3.00E+05	2.00E+05	1.00E+05	6.67E-01	5.00E-01	1.00E-01	9.47E-01	9.47E-01	9.47E-01
41	5.00E+04	3.00E+04	1.00E+04	2.00E-01	1.00E-01	1.00E-01	1.08E-01	1.08E-01	1.08E-01
42	6.00E+01	4.00E+01	1.00E+01	5.00E-01	2.50E-01	5.00E-01	4.83E+00	4.83E+00	4.83E+00
43	3.00E+03	1.00E+03	2.00E+02	3.33E+00	1.00E+01	1.50E+01	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
44	3.00E+03	2.00E+03	5.00E+02	3.33E-01	5.00E-01	1.00E+00	1.76E-01	1.76E-01	1.76E-01
45	2.00E+02	1.00E+02	5.00E+01	5.00E+00	2.00E+00	2.00E+00	1.40E-01	1.40E-01	1.40E-01
46	1.00E+01	8.00E+00	2.00E+00	5.00E-01	3.75E-01	8.50E-01	3.48E-02	3.48E-02	3.48E-02
47	1.00E+03	1.00E+03	1.00E+03	1.00E+00	1.00E+00	1.00E+00	4.40E-02	4.40E-02	4.40E-02
48	1.00E+04	1.00E+04	3.00E+03	5.00E-02	5.00E-02	1.67E-01	3.44E-02	3.44E-02	3.44E-02
49	3.00E+05	2.00E+05	1.00E+05	3.33E-02	5.00E-02	5.00E-02	2.30E-01	2.30E-01	2.30E-01
50	5.00E+04	3.00E+04	1.00E+04	2.00E-02	3.33E-02	1.00E-01	6.37E-02	6.37E-02	6.37E-02
51	6.00E+01	4.00E+01	1.00E+01	6.67E-01	5.00E-01	1.00E+00	5.96E+00	5.96E+00	5.96E+00

(continued)

Table 6-3c. (continued)

	True P1 MOEs			True P2/P1 MOE Ratio			Predicted P2/True P1 MOE Ratio		
Run No.	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**	**90th %**	**95th %**	**99th %**
52	3.00E+03	1.00E+03	2.00E+02	1.67E-01	3.00E-01	1.00E+00	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
53	3.00E+03	2.00E+03	5.00E+02	3.33E-01	5.00E-01	6.00E-01	3.24E-01	3.24E-01	3.24E-01
54	2.00E+02	1.00E+02	5.00E+01	2.50E+00	2.00E+00	2.00E+00	1.47E-01	1.47E-01	1.47E-01
55	6.00E-01	3.00E-01	8.00E-02	2.83E+00	2.67E+00	2.50E+00	4.29E-01	4.29E-01	4.29E-01
56	7.00E+01	6.00E+01	4.00E+01	1.43E-01	1.67E-01	2.00E-01	2.26E-01	2.26E-01	2.26E-01
57	2.00E+02	1.00E+02	2.00E+01	1.50E-01	2.00E-01	5.00E-01	2.43E-01	2.43E-01	2.43E-01
58	5.00E+04	2.00E+04	5.00E+03	1.00E-01	2.50E-01	4.00E-01	9.76E-02	9.76E-02	9.76E-02
59	1.00E+03	5.00E+02	2.00E+02	5.00E-02	1.00E-01	1.00E-01	2.84E-01	2.84E-01	2.84E-01
60	2.00E+01	6.00E+00	2.00E+00	1.00E+00	3.33E+00	2.00E+00	1.25E+00	1.25E+00	1.25E+00
61	3.00E+03	1.00E+03	5.00E+02	3.33E-02	5.00E-02	4.00E-02	1.67E-03	1.67E-03	1.67E-03
62	1.00E+03	1.00E+03	5.00E+02	2.00E-01	1.00E-01	2.00E-01	9.09E-01	9.09E-01	9.09E-01
63	1.00E+02	1.00E+02	5.00E+01	5.00E+00	2.00E+00	2.00E+00	2.28E+00	2.28E+00	2.28E+00
64	6.00E-01	3.00E-01	8.00E-02	2.83E+00	2.67E+00	2.50E+00	3.81E+00	3.81E+00	3.81E+00
65	7.00E+01	6.00E+01	4.00E+01	1.43E+01	1.67E+01	2.50E+01	8.38E+01	8.38E+01	8.38E+01
66	2.00E+02	1.00E+02	2.00E+01	2.50E+01	2.00E+01	5.00E+01	4.14E+01	4.14E+01	4.14E+01
67	5.00E+04	2.00E+04	5.00E+03	4.00E+00	5.00E+00	2.00E+01	8.73E+00	8.73E+00	8.73E+00
68	1.00E+03	5.00E+02	2.00E+02	2.00E+01	2.00E+01	5.00E+01	2.05E+01	2.05E+01	2.05E+01
69	2.00E+01	6.00E+00	2.00E+00	1.00E+00	1.67E+00	3.00E+00	5.84E-01	5.84E-01	5.84E-01
70	3.00E+03	1.00E+03	5.00E+02	3.33E-01	1.00E+00	1.00E+00	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
71	1.00E+03	1.00E+03	5.00E+02	1.00E+00	5.00E-01	2.00E-01	1.89E+00	1.89E+00	1.89E+00
72	1.00E+02	1.00E+02	5.00E+01	2.00E+00	1.00E+00	1.00E+00	3.48E+01	3.48E+01	3.48E+01
73	1.70E+00	8.00E-01	2.00E-01	3.53E-01	3.75E-01	4.00E-01	2.33E+00	2.33E+00	2.33E+00
74	1.00E+01	1.00E+01	8.00E+00	7.00E+00	6.00E+00	5.00E+00	4.43E+00	4.43E+00	4.43E+00
75	3.00E+01	2.00E+01	1.00E+01	6.67E+00	5.00E+00	2.00E+00	4.12E+00	4.12E+00	4.12E+00
76	5.00E+03	5.00E+03	2.00E+03	1.00E+01	4.00E+00	2.50E+00	1.03E+01	1.03E+01	1.03E+01
77	5.00E+01	5.00E+01	2.00E+01	2.00E+01	1.00E+01	1.00E+01	3.52E+00	3.52E+00	3.52E+00

(continued)

Table 6-3c. (continued)

Run No.	True P1 MOEs			True P2/P1 MOE Ratio			Predicted P2/True P1 MOE Ratio		
	90th %	95th %	99th %	90th %	95th %	99th %	90th %	95th %	99th %
78	2.00E+01	2.00E+01	4.00E+00	1.00E+00	3.00E-01	5.00E-01	7.97E-01	7.97E-01	7.97E-01
79	1.00E+02	5.00E+01	2.00E+01	3.00E+01	2.00E+01	2.50E+01	5.98E+02	5.98E+02	5.98E+02
80	2.00E+02	1.00E+02	1.00E+02	5.00E+00	1.00E+01	5.00E+00	1.10E+00	1.10E+00	1.10E+00
81	5.00E+02	2.00E+02	1.00E+02	2.00E-01	5.00E-01	5.00E-01	4.39E-01	4.39E-01	4.39E-01
82	1.70E+00	8.00E-01	2.00E-01	1.00E+00	1.00E+00	1.00E+00	8.88E+00	8.88E+00	8.88E+00
83	1.00E+01	1.00E+01	8.00E+00	1.00E+02	1.00E+02	1.25E+02	3.71E+02	3.71E+02	3.71E+02
84	3.00E+01	2.00E+01	1.00E+01	1.67E+02	1.00E+02	1.00E+02	1.13E+03	1.13E+03	1.13E+03
85	5.00E+03	5.00E+03	2.00E+03	4.00E+01	2.00E+01	5.00E+01	8.95E+01	8.95E+01	8.95E+01
86	5.00E+01	5.00E+01	2.00E+01	4.00E+02	2.00E+02	5.00E+02	9.99E+01	9.99E+01	9.99E+01
87	2.00E+01	2.00E+01	4.00E+00	1.00E+00	5.00E-01	1.50E+00	8.80E-02	8.80E-02	8.80E-02
88	1.00E+02	5.00E+01	2.00E+01	1.00E+01	2.00E+01	2.50E+01	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
89	2.00E+02	1.00E+02	1.00E+02	5.00E+00	5.00E+00	1.00E+00	2.08E+00	2.08E+00	2.08E+00
90	5.00E+02	2.00E+02	1.00E+02	4.00E-01	5.00E-01	5.00E-01	2.47E+01	2.47E+01	2.47E+01
91	1.70E+00	8.00E-01	2.00E-01	3.53E-01	3.75E-01	4.00E-01	2.62E-01	2.62E-01	2.62E-01
92	1.00E+03	1.00E+03	1.00E+03	7.00E-02	6.00E-02	4.00E-02	1.19E-02	1.19E-02	1.19E-02
93	5.00E+03	2.00E+03	1.00E+03	4.00E-02	5.00E-02	2.00E-02	2.41E-02	2.41E-02	2.41E-02
94	2.00E+05	1.00E+05	1.00E+05	2.50E-01	2.00E-01	5.00E-02	1.15E-01	1.15E-01	1.15E-01
95	2.00E+04	1.00E+04	1.00E+04	5.00E-02	5.00E-02	2.00E-02	4.89E-02	4.89E-02	4.89E-02
96	2.00E+01	1.00E+01	6.00E+00	1.00E+00	6.00E-01	3.33E-01	1.71E+00	1.71E+00	1.71E+00
97	1.00E+03	1.00E+03	5.00E+02	3.00E+00	1.00E+00	1.00E+00	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
98	1.00E+03	5.00E+02	1.00E+02	1.00E+00	2.00E+00	5.00E+00	5.29E-01	5.29E-01	5.29E-01
99	2.00E+02	1.00E+02	5.00E+01	5.00E-01	1.00E+00	1.00E+00	2.87E-02	2.87E-02	2.87E-02
100	1.70E+00	8.00E-01	2.00E-01	1.00E+00	1.00E+00	1.00E+00	1.13E-01	1.13E-01	1.13E-01
101	1.00E+03	1.00E+03	1.00E+03	1.00E-02	1.00E-02	8.00E-03	2.70E-03	2.70E-03	2.70E-03
102	5.00E+03	2.00E+03	1.00E+03	6.00E-03	1.00E-02	1.00E-02	8.82E-04	8.82E-04	8.82E-04
103	2.00E+05	1.00E+05	1.00E+05	2.50E-02	5.00E-02	2.00E-02	1.12E-02	1.12E-02	1.12E-02

(continued)

Table 6-3c. (continued)

Run No.	True P1 MOEs			True P2/P1 MOE Ratio			Predicted P2/True P1 MOE Ratio		
	90th %	95th %	99th %	90th %	95th %	99th %	90th %	95th %	99th %
104	2.00E+04	1.00E+04	1.00E+04	2.50E-03	5.00E-03	2.00E-03	1.00E-02	1.00E-02	1.00E-02
105	2.00E+01	1.00E+01	6.00E+00	1.00E+00	2.00E+00	6.67E-01	1.14E+01	1.14E+01	1.14E+01
106	1.00E+03	1.00E+03	5.00E+02	1.00E-01	5.00E-02	4.00E-02	Insufficient Data for MOE	Insufficient Data for MOE	Insufficient Data for MOE
107	1.00E+03	5.00E+02	1.00E+02	2.00E-01	2.00E-01	1.00E+00	4.81E-01	4.81E-01	4.81E-01
108	2.00E+02	1.00E+02	5.00E+01	2.50E+00	2.00E+00	2.00E+00	4.05E-02	4.05E-02	4.05E-02

Table 6-4. Correlation Coefficients (R) and p-Values for Variable vs. True P2 MOE/ True P1 MOE Ratio (Equal Megavariable Weights – Weighting Scenario 1)

Variable	90th Percentile MOEs		95th Percentile MOEs		99th Percentile MOEs	
	R	p-Value	R	p-Value	R	p-Value
GrandScore	0.371	7.58E-5	0.406	1.33E-5	0.318	7.82E-4
GrandScore/Reliability	0.421	5.87E-6	0.450	1.02E-6	0.362	1.19E-4
Count "+1"	0.162	9.41E-2	0.171	7.71E-2	0.142	0.143
Count "-1"	-0.164	9.07E-2	-0.174	7.21E-2	-0.142	0.142
Count "0"	9.78E-4	0.992	1.35E-3	0.999	-3.76E-4	0.997
Count "-1" + Count "888"	-0.157	0.104	-0.167	8.37E-2	-0.137	0.158
Count "0" + Count "+1"	0.137	0.157	0.145	0.134	0.119	0.222
Count "888"	6.73E-4	0.994	5.37E-4	0.996	2.84E-4	0.998

Of the various scores, counts, and aggregated counts, several correlation coefficients are not statistically significant (not different from zero) at any reasonable alpha (e.g., p-value < 0.05) for any of the MOE percentiles. Neither Count "0" nor Count "888" (not zero) was expected to have much correlation with the MOE ratios, and indeed, they do not. In addition, neither of the aggregated counts (i.e., Count "-1" + Count "888" and Count "0" + Count "+1") have statistically significant correlations, at least at alpha = 0.05, although they are close. The GrandScore and normalized GrandScore are highly significant correlations. Count "+1," and Count "-1" are not quite significant at 0.05, but approach significance. It is noted that the normalized GrandScore outperforms the GrandScore, and also outperforms Count "+1" and Count "-1."

In addition to these correlations, correlation coefficients were estimated for the predicted P2 MOE variable versus true P2 MOE variable for the three MOE percentiles. Although the predicted P2 MOE is simplistic in that it ignores all risk-affecting variables other than emissions rates, one would expect to find a relatively strong and statistically significant positive correlation. Indeed, the estimated correlation coefficients were all reasonably strong at 0.739, 0.607, and 0.600 for 90th, 95th, and 99th percentiles, respectively, and were all highly significant (p-values < 10^{-10}), which bodes favorably for use of the predicted P2 MOE for decision-making.

The correlations shown in Table 6-4 all assume equal weights among the four megavariables (i.e., emission rates, stack characteristics, population characteristics, and meteorological conditions all contribute equally to the scores and counts). We also experimented with assigning different weights to those megavariables and rerunning the correlations, to see if correlations could be enhanced, in the hope that enhancement of correlations would lead to improved performance. Only the normalized GrandScore and Count "+1" and Count "-1" were considered, given the poor performance of the other variables in the equal-megavariable-weight ("Weighting Scenario 1") analysis shown in Table 6-4. These additional correlation results are shown in Table 6-5. The first four sets of results (Weighting Scenarios 2–5) are essentially a sensitivity analysis among the megavariables to see which individually are the best performers: the first four sets of results assign a weight of 1 to a single megavariable and weights of 0 to the other three. As can be seen, all four megavariables provide significant, but not particularly strong, correlations. Not surprisingly, emissions (Weighting Scenario 2) is the best individual predictor among the megavariables.

Weighting Scenario 3 (stack megavariable sensitivity) generated unexpected signs on the correlations. The normalized GrandScore and Count "+1" correlation coefficients are negative, while the Count "-1" correlation coefficient is positive. Some analyses were performed examining correlations between stack height and emissions rates, stack buoyancy flux and emissions rates, and height and flux in an attempt to understand whether stack height or buoyancy flux are acting as surrogates for emission rates. In addition, experiments were conducted that considered different tails of the distributions in the percentile comparisons (the lower tails on these distributions had been previously judged to be most relevant to risk), as well as treating those results differently with regard to P2 risk-favorability. These analyses were inconclusive.

Table 6-5. Correlation Coefficients (R) and p-Values for Variable vs. True P2 MOE/ True P1 MOE Ratio (for Various Megavariable Weights)

Variable	90^{th} Percentile MOEs		95^{th} Percentile MOEs		99^{th} Percentile MOEs	
	R	p-Value	R	p-Value	R	p-Value
Weighting Scenario 2: MegaVariable Weights: Emission = 1, Stack = 0, Population = 0, Meteorological = 0						
GrandScore/Reliability	0.401	1.67E-5	0.468	3.17E-7	0.369	8.63E-5
Count "+1"	0.322	6.75E-4	0.384	4.10E-5	0.294	2.01E-3
Count "-1"	-0.323	6.48E-4	-0.385	3.80E-5	-0.295	1.96E-3
Weighting Scenario 3: MegaVariable Weights: Emission = 0, Stack = 1, Population = 0, Meteorological = 0						
GrandScore/Reliability	-0.368	9.09E-5	-0.430	3.50E-6	-0.320	7.46E-4
Count "+1"	-0.327	5.49E-4	-0.389	3.24E-5	-0.290	2.37E-3
Count "-1"	0.327	5.57E-4	0.388	3.31E-5	0.290	2.34E-3
Weighting Scenario 4: MegaVariable Weights: Emission = 0, Stack = 0, Population = 1, Meteorological = 0						
GrandScore/Reliability	0.389	3.16E-5	0.413	9.05E-6	0.314	9.55E-4
Count "+1"	0.344	2.72E-4	0.354	1.67E-4	0.281	3.23E-3
Count "-1"	-0.345	2.61E-4	-0.357	1.49E-4	-0.281	3.27E-3
Weighting Scenario 5: MegaVariable Weights: Emission = 0, Stack = 0, Population = 0, Meteorological = 1						
GrandScore/Reliability	0.334	4.08E-4	0.371	7.81E-5	0.273	4.31E-3
Count "+1"	0.238	1.30E-2	0.261	6.39E-3	0.181	6.08E-2
Count "-1"	-0.238	1.31E-2	-0.260	6.52E-3	-0.181	6.04E-2
Weighting Scenario 6: MegaVariable Weights: Emission = 1, Stack = 0, Population = 1, Meteorological = 1						
GrandScore/Reliability	0.492	6.31E-8	0.546	9.49E-10	0.425	4.47E-6
Count "+1"	0.394	2.44E-5	0.450	1.03E-6	0.348	2.26E-4
Count "-1"	-0.395	2.30E-5	-0.452	9.03E-7	-0.348	2.23E-4
Weighting Scenario 7: MegaVariable Weights: Emission = 2, Stack = 0, Population = 1, Meteorological = 1						
GrandScore/Reliability	0.477	1.84E-7	0.537	2.06E-9	0.420	5.96E-6
Count "+1"	0.367	9.35E-5	0.426	4.17E-6	0.328	5.21E-4
Count "-1"	-0.368	8.88E-5	-0.428	3.75E-6	-0.329	5.11E-4

(continued)

Table 6-5 (continued)

Variable	90th Percentile MOEs		95th Percentile MOEs		99th Percentile MOEs	
	R	p-Value	R	p-Value	R	p-Value
Weighting Scenario 8: MegaVariable Weights: Emission = 2, Stack = 0, Population = 2, Meteorological = 1						
GrandScore/Reliability	0.478	1.71E-7	0.537	2.16E-9	0.419	6.22E-6
Count “+1”	0.377	5.78E-5	0.435	2.50E-6	0.336	3.82E-4
Count “-1”	-0.378	5.47E-5	-0.437	2.23E-6	-0.336	3.75E-4
Weighting Scenario 9: MegaVariable Weights: Emission = 4, Stack = 3, Population = 2, Meteorological = 1						
GrandScore/Reliability	0.389	3.16E-5	0.430	3.41E-6	0.348	2.21E-4
Count “+1”	0.181	0.061	0.204	0.034	0.164	0.089
Count “-1”	-0.182	0.059	-0.206	0.032	-0.165	0.089

Weighting Scenarios 6–9 constitute experiments to see if different, nonzero weights among the megavariables result in higher correlations. Weighting Scenarios 6–8 omit the stack megavariable (weight = 0), given the unexpected results discussed above. Weighting Scenario 9 includes it, however, and the megavariable weights for scenario 9 were assigned in order of relative sensitivity to individual megavariables, as given by the absolute values of the correlation coefficients for Weighting Scenarios 2–5. There is not a lot of difference among scenarios 6–9 but, the highest correlations generally occur for Weighting Scenario 6, with megavariable weights of emissions = 1, stack = 0, population = 1, and meteorological = 1. Moreover, the correlations are much improved over Weighting Scenario 1 (equal weights for all megavariables), as seen in Table 6-4. Weighting Scenario 9 exhibits poorer correlations across the board. It is important to note that even with the stack megavariable assigned a weight = 0 in scenarios 6, 7, and 8, the correlations with the stack variables are still accounted for. This is because the the subset of variables associated with the emissions, population, and meteorological megavariables incorporate correlations with all other variables.

6.3 Evaluation of Tier 1 Decision Rules

We now consider alternative decision rules for interpreting the results of the comparative analysis in order to draw conclusions about the likely impact on risk. Again, the assumption of the cross-validation analysis is that the known (modeled) MOEs from the P2 Category are assumed to be unknown. The performance of the decision rules can then be assessed by comparing the estimated (predicted) P2 MOEs to the known P2 MOEs. The first set of decision rules is concerned only with predicting the direction of P2 versus P1 risk, i.e., whether the P2 risk is greater than the P1 risk, and not how much greater or whether some critical condition (e.g., risk of concern) is violated. These are termed “Tier 1” decision rules.

The performances of the various decision rules are best considered in the context of a hypothesis test. Let the null hypothesis, H0, be H0 : true P2 MOE >= true P1 MOE, or equivalently, H0: true P2 MOE/true P1 MOE >= 1.0. Thus, the null hypothesis is that the P2 category involves the same or less risk as the P1 category to which it is being compared. If H0 is rejected, then the alternative hypothesis (Ha) is implicitly accepted, i.e., Ha: true P2 MOE/true P1 MOE < 1. There are two types of errors that can be made by applying the decision rules. A false positive would reject H0 when it is true, erroneously concluding that P2 has higher risks when it does not. A false positive has adverse economic implications. Conversely, a false negative would fail to reject H0 when it is false, erroneously concluding that P2 has equal or lower risks when the true P2 risks are greater. False negatives have adverse environmental and health implications.

The Tier 1 decision rules considered are listed below.

- Decision Rule 1: IF normalized Grand Score < 0, THEN reject H0
- Decision Rule 2: IF Count "-1" > Count "+1," THEN reject H0
- Decision Rule 3: IF normalized Grand Score < 0 AND Count "-1" > Count "+1," THEN reject H0
- Decision Rule 4: IF normalized Grand Score < 0 OR Count "-1" > Count "+1," THEN reject H0
- Decision Rule 5: IF predicted P2 MOE < true P1 MOE THEN reject H0.

It can be seen that Decision Rule 4 differs from Decision Rule 3 by substituting "OR" for "AND" in the condition Grand Score < 0 AND Count "-1" > Count "+1." The motivation for this modification is that use of the "OR" operator maximizes the number of comparisons eligible for consideration and, in theory, should help control false negative error rates.

Table 6-6 presents the success rates, false positive rates, and false negative rates for Decision Rules 1–5 for all weighting scenarios. These results are given for each MOE percentile as well as the average across the three percentiles. The weights for the various weighting scenarios are as previously given in Table 6-5. The success and failure rates were calculated to be comparable across decision rules as follows. The success rate is the number of successful decisions expressed as a percentage of all comparisons made (108). A "successful" outcome can occur either because the decision rule was triggered, e.g., "IF normalized Grand Score < 0", and H0 was correctly rejected (an explicit success), or the decision rule was not triggered and H0 was true anyway (an implicit success). The false positive error rate is expressed as a percentage of the subset of the 108 comparisons for which true P2 MOE/true P1 MOE >= 1.0. (There are 63, 61, and 64 of these for 90th percentile, 95th percentile, and 99th percentile MOEs, respectively.) Similarly, the false negative rate is expressed as a percentage of the 108 comparisons for which true P2 MOE/true P1 MOE < 1.0. (There are 45, 47, and 44 or these, respectively, for the three MOE percentiles.) Thus, if testing the null hypothesis can be considered analogous to the familiar "innocent until proven guilty" dictum, i.e., P2 less risky than P1 unless H0 rejected, then the false positive rate is the percentage of "innocents" found guilty and the false negative rate is the percentage of "guilty" found innocent.

Table 6-7 presents the individual comparison success rates for Weighting Scenario 1, the equal megavariable weighting scenario, for purposes of illustration. The scores, counts, and other data for these results are as given previously in Table 6-3. "SC" denotes an explicit success while "S" denotes an implicit success. "F+" denotes a false positive error. "F-" denotes a false negative error. The "Run No." field maps Tables 6-3 and 6-7.

Table 6-6. Success Rates/Type 2 Error Rates (%) for Tier 1 Decision Rules

Weighting		DR1				DR2				DR3				DR4				DR5			
Scenario	Rate	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
1	% Success	62.0	63.9	63.0	63.0	63.9	65.7	66.7	65.4	63.0	66.7	67.6	65.7	63.0	63.0	62.0	62.7	75.0	74.0	70.0	73.0
	% False +	39.7	37.7	39.1	38.8	36.5	34.4	34.4	35.1	27.0	23.0	23.4	24.5	49.2	49.2	50.0	49.5	28.8	28.6	32.8	30.0
	% False -	35.6	34.0	34.1	34.6	35.6	34.0	31.8	33.8	51.1	46.8	45.5	47.8	20.0	21.3	20.5	20.6	19.5	22.7	26.2	22.8
2	% Success	73.1	71.3	70.4	71.6	73.1	71.3	70.4	71.6	73.1	71.3	70.4	71.6	73.1	71.3	70.4	71.6	75.0	74.0	70.0	73.0
	% False +	20.6	21.3	23.4	21.8	20.6	21.3	23.4	21.8	20.6	21.3	23.4	21.8	20.6	21.3	23.4	21.8	28.8	28.6	32.8	30.0
	% False -	35.6	38.3	38.6	37.5	35.6	38.3	38.6	37.5	35.6	38.3	38.6	37.5	35.6	38.3	38.6	37.5	19.5	22.7	26.2	22.8
3	% Success	25.0	28.7	31.5	28.4	25.0	28.7	31.5	28.4	25.0	28.7	31.5	28.4	25.0	28.7	31.5	28.4	75.0	74.0	70.0	73.0
	% False +	71.4	68.9	65.6	68.6	71.4	68.9	65.6	68.6	71.4	68.9	65.6	68.6	71.4	68.9	65.6	68.6	28.8	28.6	32.8	30.0
	% False -	80.0	74.5	72.7	75.7	80.0	74.5	72.7	75.7	80.0	74.5	72.7	75.7	80.0	74.5	72.7	75.7	19.5	22.7	26.2	22.8
4	% Success	60.2	56.5	53.7	56.8	60.2	56.5	53.7	56.8	60.2	56.5	53.7	56.8	60.2	56.5	53.7	56.8	75.0	74.0	70.0	73.0
	% False +	39.7	42.6	45.3	42.5	39.7	42.6	45.3	42.5	39.7	42.6	45.3	42.5	39.7	42.6	45.3	42.5	28.8	28.6	32.8	30.0
	% False -	40.0	44.7	47.7	44.1	40.0	44.7	47.7	44.1	40.0	44.7	47.7	44.1	40.0	44.7	47.7	44.1	19.5	22.7	26.2	22.8
5	% Success	59.3	57.4	56.5	57.7	59.3	57.4	56.5	57.7	59.3	57.4	56.5	57.7	59.3	57.4	56.5	57.7	75.0	74.0	70.0	73.0
	% False +	38.1	39.3	40.6	39.4	38.1	39.3	40.6	39.4	38.1	39.3	40.6	39.4	38.1	39.3	40.6	39.4	28.8	28.6	32.8	30.0
	% False -	44.4	46.8	47.7	46.3	44.4	46.8	47.7	46.3	44.4	46.8	47.7	46.3	44.4	46.8	47.7	46.3	19.5	22.7	26.2	22.8
6	% Success	78.7	73.1	70.4	74.1	76.9	73.1	68.5	72.8	78.7	73.1	70.4	74.1	76.9	73.1	68.5	72.8	75.0	74.0	70.0	73.0
	% False +	25.4	29.5	32.8	29.2	27.0	29.5	34.4	30.3	23.8	27.9	31.3	27.6	28.6	31.1	35.9	31.9	28.8	28.6	32.8	30.0
	% False -	15.6	23.4	25.0	21.3	17.8	23.4	27.3	22.8	17.8	25.5	27.3	23.5	15.6	21.3	25.0	20.6	19.5	22.7	26.2	22.8
7	% Success	76.9	73.1	68.5	72.8	76.9	73.1	68.5	72.8	76.9	73.1	68.5	72.8	76.9	73.1	68.5	72.8	75.0	74.0	70.0	73.0
	% False +	27.0	29.5	34.4	30.3	27.0	29.5	34.4	30.3	27.0	29.5	34.4	30.3	27.0	29.5	34.4	30.3	28.8	28.6	32.8	30.0
	% False -	17.8	23.4	27.3	22.8	17.8	23.4	27.3	22.8	17.8	23.4	27.3	22.8	17.8	23.4	27.3	22.8	19.5	22.7	26.2	22.8

(continued)

Table 6-6. (continued)

Weighting		DR1				DR2				DR3				DR4				DR5			
Scenario	Rate	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
8	% Success	76.9	73.1	68.5	72.8	76.9	73.1	68.5	72.8	76.9	73.1	68.5	72.8	76.9	73.1	68.5	72.8	75.0	74.0	70.0	73.0
	% False +	27.0	29.5	34.4	30.3	27.0	29.5	34.4	30.3	27.0	29.5	34.4	30.3	27.0	29.5	34.4	30.3	28.8	28.6	32.8	30.0
	% False -	17.8	23.4	27.3	22.8	17.8	23.4	27.3	22.8	17.8	23.4	27.3	22.8	17.8	23.4	27.3	22.8	19.5	22.7	26.2	22.8
9	% Success	71.3	71.3	70.4	71.0	65.7	67.6	68.5	67.3	68.5	70.4	71.3	70.1	68.5	68.5	67.6	68.2	75.0	74.0	70.0	73.0
	% False +	31.7	31.1	32.8	31.9	36.5	34.4	34.4	35.1	31.7	29.5	29.7	30.3	36.5	36.1	37.5	36.7	28.8	28.6	32.8	30.0
	% False -	24.4	25.5	25.0	25.0	31.1	29.8	27.3	29.4	31.1	29.8	27.3	29.4	24.4	25.5	25.0	25.0	19.5	22.7	26.2	22.8

Again, these Tier 1 decision rules are concerned only with correct prediction of risk direction, not absolute risk values. Reviewing Table 6-6 regarding the relative performances of Decision Rules 1 and 2 (i.e., the ones that use either the Grand Score or the counts) we see mixed results. For some Weighting Scenarios, Decision Rule 1 is the better performer while for other Weighting Scenarios, Decision Rule 2 is better for other Weighting Scenarios. Decision Rule 3, which combines Decision Rules 1 and 2, is very similar in terms of success rate to Decision Rules 1 and 2. Where it is slightly superior, as one would expect given the "AND" condition, is in reducing the false positive rates relative to either Decision Rule 1 or 2. (Both of Decision Rules 1 and 2's "IF" condition have to be applicable to reject H0 under Decision Rule 3; therefore, a smaller subpopulation is available from which false positives can be made. This necessarily increases the subpopulation size from which false negative errors can be made, so the false negative error rate increases somewhat relative to Decision Rules 1 and 2.) For Decision Rule 4 (the "OR" condition), success rates are also generally similar to the preceding rules but, because the "OR" condition will increase the subpopulation from which H0 can be rejected, where there are differences, we see slight increases in false positive rates relative to Decision Rule 3, and concomitant decreases in false negatives. Interestingly, Decision Rule 5 (that relies only on predicted MOEs, i.e., emission rates, and is thus constant across the Weighting Scenarios) is in most (but not all) cases as good as or superior to Decision Rules 1–4 (which use megavariable information) with respect to success rates and error rates. This bodes well for further use of Decision Rule 5.

Given the relative success that the predicted P2 MOE (Decision Rule 5) has in predicting *direction* of risk, it is natural to wonder how good it is in accurately predicting the true P2 MOE itself. That question is addressed by the column in Table 6-3 labeled "Predicted P2 MOE/True P2 MOE." These are ratios of predicted P2 MOE to true P2 MOE, except that values where predicted P2 MOE < true P2 MOE (ratios between 0 and 1) have been replaced by the transformation "-true P2 MOE/predicted P2 MOE," for the same statistical reasons as discussed previously. Thus, a value of this ratio equal to 1 reflects no difference between the true and predicted P2 MOE. Values greater than 1 reflect overpredictions while values less than 1 reflect underpredictions. There does not appear to be any significant bias in the predictions. The mean and median errors of these ratios are near zero[2] (see Table 6-3). (However, because the 108 comparisons consist of all permutations of three source categories taken two at a time, the comparisons are symmetric with respect to one another, e.g., in runs 1-9, OINC_L [P2] are compared to CINC_ALL [P1] and in runs 10 -18, CINC_ALL [P2] are compared to OINC_L [P1]. Therefore, no signficant bias would be expected.) Regarding precision, however, there are quite a few predictions that are in substantial error. The standard deviations of the ratios are approximately 12 for each of the MOE percentiles. Thus, assuming these data are approximately normally distributed, some 67 percent of the P2 MOE predictions could be expected to involve an error (in either direction) of a factor of 12 (i.e., slightly over an order of magnitude) or less. However, it would not be unusual (33 percent) to have prediction errors that are greater than an order of magnitude, and we can conclude that there is a sufficient lack of precision that one would not want to rely exclusively on Decision Rule 5 for decision-making.

[2] Because of the transformation, an unbiased estimate would have a mean of zero, not 1.

Table 6-7. Tier 1 Decision Rule Success and Failures Rates for Weighting Scenario 1

	DR1				DR2				DR3				DR4				DR5			
Run No.	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**
1	S	S	S		S	S	S		S	S	S		S	S	S		F+	F+	F+	
2	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		F+	F+	F+	
3	S	S	S		S	S	S		S	S	S		S	S	S		F+	F+	F+	
4	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		SC	SC	SC	
5	F-	F-	S		F-	F-	S		F-	F-	S		F-	F-	S		SC	SC	F+	
6	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
7	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
8	F+	F+	SC		S	S	F-		S	S	F-		F+	F+	SC		F+	F+	SC	
9	SC	F+	F+		F-	S	S		F-	S	S		SC	F+	F+		F-	S	S	
10	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
11	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
12	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		S	S	S	
13	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
14	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		S	S	S	
15	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
16	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC					
17	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
18	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		F-	F-	F-	
19	F+	SC	SC		F+	SC	SC		F+	SC	SC		F+	SC	SC		S	F-	F-	
20	F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC		F-	F-	F-	
21	F+	F+	SC		F+	F+	SC		F+	F+	SC		F+	F+	SC		S	S	F-	
22	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		S	S	S	
23	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		S	S	S	
24	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
25	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	

(continued)

Table 6-7. (continued)

Run No.	DR1				DR2				DR3				DR4				DR5			
	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
26	S	S	S		F+	F+	F+		S	S	S		F+	F+	F+		S	S	S	
27	S	S	S		F+	F+	F+		S	S	S		F+	F+	F+		F+	F+	F+	
28	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		S	S	S	
29	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
30	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
31	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
32	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
33	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
34	S	S	S		F+	F+	F+		S	S	S		F+	F+	F+					
35	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
36	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
37	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
38	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
39	F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC		SC	SC	SC	
40	SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC		SC	SC	SC	
41	F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC		SC	SC	SC	
42	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
43	S	S	S		S	S	S		S	S	S		S	S	S					
44	SC	SC	F+		SC	SC	F+		SC	SC	F+		SC	SC	F+		SC	SC	F+	
45	S	S	S		S	S	S		S	S	S		S	S	S		F+	F+	F+	
46	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		SC	SC	SC	
47	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
48	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
49	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
50	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
51	F-	F-	S		F-	F-	S		F-	F-	S		F-	F-	S		F-	F-	S	
52	SC	SC	F+		F-	F-	S		F-	F-	S		SC	SC	F+					

(continued)

Table 6-7. (continued)

Run No.	DR1 90th %	DR1 95th %	DR1 99th %	DR1 % Avg	DR2 90th %	DR2 95th %	DR2 99th %	DR2 % Avg	DR3 90th %	DR3 95th %	DR3 99th %	DR3 % Avg	DR4 90th %	DR4 95th %	DR4 99th %	DR4 % Avg	DR5 90th %	DR5 95th %	DR5 99th %	DR5 % Avg
53	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
54	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
55	S	S	S		S	S	S		S	S	S		S	S	S		F+	F+	F+	
56	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
57	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		SC	SC	SC	
58	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
59	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		SC	SC	SC	
60	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
61	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
62	SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC		SC	SC	SC	
63	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		S	S	S	
64	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
65	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
66	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		S	S	S	
67	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
68	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		S	S	S	
69	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
70	SC	F+	F+		SC	F+	F+		SC	F+	F+		SC	F+	F+					
71	F+	SC	SC		F+	SC	SC		F+	SC	SC		F+	SC	SC		S	F-	F-	
72	F+	F+	F+		S	S	S		S	S	S		F+	F+	F+		S	S	S	
73	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		F-	F-	F-	
74	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
75	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		S	S	S	
76	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
77	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		S	S	S	
78	F+	SC	SC		F+	SC	SC		F+	SC	SC		F+	SC	SC		F+	SC	SC	
79	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	

(continued)

Table 6-7. (continued)

Run No.	DR1				DR2				DR3				DR4				DR5			
	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
80	S	S	S		F+	F+	F+		S	S	S		F+	F+	F+		S	S	S	
81	F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC		SC	SC	SC	
82	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		S	S	S	
83	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
84	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
85	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
86	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
87	F+	SC	F+		F+	SC	F+		F+	SC	F+		F+	SC	F+		F+	SC	F+	
88	S	S	S		F+	F+	F+		S	S	S		F+	F+	F+					
89	S	S	S		F+	F+	F+		S	S	S		F+	F+	F+		S	S	S	
90	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
91	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
92	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
93	F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC		SC	SC	SC	
94	SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC		SC	SC	SC	
95	F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC		SC	SC	SC	
96	S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-	
97	S	S	S		S	S	S		S	S	S		S	S	S					
98	S	S	S		S	S	S		S	S	S		S	S	S		F+	F+	F+	
99	F-	S	S		SC	F+	F+		F-	S	S		SC	F+	F+		SC	F+	F+	
100	S	S	S		S	S	S		S	S	S		S	S	S		F+	F+	F+	
101	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
102	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
103	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
104	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
105	S	S	F-		S	S	F-		S	S	F-		S	S	F-		S	S	F-	
106	SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC					

(continued)

Table 6-7. (continued)

Run No.	DR1				DR2				DR3				DR4				DR5			
	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
107	SC	SC	F+		F-	F-	S		F-	F-	S		SC	SC	F+		SC	SC	F+	
108	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
# SC:	29	31	29		29	31	30		22	25	24		36	37	35		33	34	31	
# S:	38	38	39		40	40	42		46	47	49		32	31	32		42	40	39	
% SC or S:	62	64	63	63	64	66	67	65	63	67	68	66	63	63	62	63	75	74	70	73
# F+ Failures:	25	23	25		23	21	22		17	14	15		31	30	32		17	16	19	
% F+ Failures	40	38	39	39	37	34	34	35	27	23	23	24	49	49	50	49	29	29	33	30
# F- Failures:	16	16	15		16	16	14		23	22	20		9	10	9		8	10	11	
% F- Failures:	36	34	34	35	36	34	32	34	51	47	45	48	20	21	20	21	20	23	26	23
check #:	108	108	108		108	108	108		108	108	108		108	108	108		100	100	100	

6.4 Evaluation of Tier 2 Decision Rules

This tier of decision rules goes beyond simply trying to predict relative risk direction. In practice, EPA needs to be able to discriminate those Phase II/New Phase I situations where not only are the unknown risks greater than the Old Phase I category to which they are being compared, but also where this greater risk will be of concern. (This latter condition motivated the inclusion of the Phase II and New Phase I MOE in RelRisk.) Accordingly, the Tier 2 decision rules combine Tier 1 Decision Rules 1, 2, 3 and 4 with the P2 predicted MOE (Decision Rule 5). Ideally, the Tier 2 decision rules would be as follows:

- Decision Rule 6: IF normalized Grand Score < 0 AND predicted P2 MOE < 1, THEN true P2 MOE is a risk concern

- Decision Rule 7: IF Count "-1" > Count "+1", AND predicted P2 MOE < 1, THEN true P2 MOE is a risk concern

- Decision Rule 8: IF normalized Grand Score < 0 AND Count "-1" > Count "+1," AND predicted P2 MOE < 1, THEN true P2 MOE is a risk concern

- Decision Rule 9: IF normalized Grand Score < 0 OR Count "-1" > Count "+1," AND predicted P2 MOE < 1, THEN true P2 MOE is a risk concern.

Unfortunately for this analysis, there are very few true P2 MOEs that are less than one; therefore, we have data that are too limited to reliabily test these decision rules in an absolute sense. However, we can accomplish the spirit of this comparison by identifying those combinations in Table 6-3 where the true P2 MOEs were less than the true P1 MOEs (P2 more risky) and then evaluating the decision rules after they have been slightly modified for this purpose. (In practice, some subset of this group would presumably involve P2 risks of concern.) The modification to the above Decision Rules 6 – 9 is to substitute for the (last) "AND" clause: "AND predicted P2 MOE/true P1 MOE < 1 THEN reject H0" (where H0 is as given previously for Tier 1, i.e., H0: true P2 MOE/true P1 MOE >= 1.0.) If we can predict this occurrence reasonably well, then presumably we would also be able to predict the subset where the P2 risks are of actual concern, i.e., MOEs < 1, reasonably well.

Similar to Table 6-6, the performances of the (modified) Tier 2 decision rules are given in Table 6-8. Similar to Table 6-7, Table 6-9 presents the individual comparison successes and failure results for Weighting Scenario 1, again for purposes of illustration. The Run No. field maps the results back to previous, Weighting Scenario 1 results.

With respect to Table 6-8, we first note that a benchmark for the Tier 2 decision rules is the previous Decision Rule 5, i.e., ignore the scores and counts and base the decision simply on the predicted P2 MOE. For this reason, Decision Rule 5 results are also included in Table 6-8. Discounting Weighting Scenarios 2 through 5 (sensitivities to megavariables), it can be seen from Table 6-8 that, although Decision Rule 5 typically has comparable success rates to the other decision rules, some marginal improvements are achieved with the new decision rules. In addition, false positive failure rates (30 percent) for Decision Rule 5 are significantly reduced by several of the new decision rules. Thus, there is clearly value added to risk predictions from the

Table 6-8. Success Rates/Type 2 Error Rates (%) for Tier 2 Decision Rules

Weighting Scenario	Rate	DR5				DR 6				DR 7				DR 8				DR 9			
		90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
1	% Success	75.0	74.0	70.0	73.0	71.0	72.0	70.0	71.0	74.0	73.0	71.0	72.7	69.0	70.0	68.0	69.0	76.0	75.0	73.0	74.7
	% False +	28.8	28.6	32.8	30.0	16.9	14.3	17.2	16.2	15.3	14.3	17.2	15.6	13.6	10.7	13.8	12.7	18.6	17.9	20.7	19.1
	% False -	19.5	22.7	26.2	22.8	46.3	45.5	47.6	46.5	41.5	43.2	45.2	43.3	56.1	54.5	57.1	55.9	31.7	34.1	35.7	33.8
2	% Success	75.0	74.0	70.0	73.0	75.0	72.0	70.0	72.3	75.0	72.0	70.0	72.3	75.0	72.0	70.0	72.3	75.0	72.0	70.0	72.3
	% False +	28.8	28.6	32.8	30.0	18.6	19.6	22.4	20.2	18.6	19.6	22.4	20.2	18.6	19.6	22.4	20.2	18.6	19.6	22.4	20.2
	% False -	19.5	22.7	26.2	22.8	34.1	38.6	40.5	37.8	34.1	38.6	40.5	37.8	34.1	38.6	40.5	37.8	34.1	38.6	40.5	37.8
3	% Success	75.0	74.0	70.0	73.0	55.0	56.0	56.0	55.7	55.0	56.0	56.0	55.7	55.0	56.0	56.0	55.7	55.0	56.0	56.0	55.7
	% False +	28.8	28.6	32.8	30.0	10.2	7.1	8.6	8.6	10.2	7.1	8.6	8.6	10.2	7.1	8.6	8.6	10.2	7.1	8.6	8.6
	% False -	19.5	22.7	26.2	22.8	95.1	90.9	92.9	93.0	95.1	90.9	92.9	93.0	95.1	90.9	92.9	93.0	95.1	90.9	92.9	93.0
4	% Success	75.0	74.0	70.0	73.0	69.0	66.0	64.0	66.3	69.0	66.0	64.0	66.3	69.0	66.0	64.0	66.3	69.0	66.0	64.0	66.3
	% False +	28.8	28.6	32.8	30.0	15.3	16.1	19.0	16.8	15.3	16.1	19.0	16.8	15.3	16.1	19.0	16.8	15.3	16.1	19.0	16.8
	% False -	19.5	22.7	26.2	22.8	53.7	56.8	59.5	56.7	53.7	56.8	59.5	56.7	53.7	56.8	59.5	56.7	53.7	56.8	59.5	56.7
5	% Success	75.0	74.0	70.0	73.0	68.0	65.0	65.0	66.0	68.0	65.0	65.0	66.0	68.0	65.0	65.0	66.0	68.0	65.0	65.0	66.0
	% False +	28.8	28.6	32.8	30.0	13.6	14.3	15.5	14.5	13.6	14.3	15.5	14.5	13.6	14.3	15.5	14.5	13.6	14.3	15.5	14.5
	% False -	19.5	22.7	26.2	22.8	58.5	61.4	61.9	60.6	58.5	61.4	61.9	60.6	58.5	61.4	61.9	60.6	58.5	61.4	61.9	60.6
6	% Success	75.0	74.0	70.0	73.0	79.0	74.0	72.0	75.0	77.0	74.0	70.0	73.7	79.0	74.0	72.0	75.0	77.0	74.0	70.0	73.7
	% False +	28.8	28.6	32.8	30.0	18.6	21.4	24.1	21.4	22.0	23.2	27.6	24.3	18.6	21.4	24.1	21.4	22.0	23.2	27.6	24.3
	% False -	19.5	22.7	26.2	22.8	24.4	31.8	33.3	29.8	24.4	29.5	33.3	29.1	24.4	31.8	33.3	29.8	24.4	29.5	33.3	29.1

(continued)

Table 6-8. (continued)

Weighting Scenario	Rate	DR5				DR 6				DR 7				DR 8				DR 9			
		90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
7	% Success	75.0	74.0	70.0	73.0	77.0	74.0	70.0	73.7	77.0	74.0	70.0	73.7	77.0	74.0	70.0	73.7	77.0	74.0	70.0	73.7
	% False +	28.8	28.6	32.8	30.0	22.0	23.2	27.6	24.3	22.0	23.2	27.6	24.3	22.0	23.2	27.6	24.3	22.0	23.2	27.6	24.3
	% False -	19.5	22.7	26.2	22.8	24.4	29.5	33.3	29.1	24.4	29.5	33.3	29.1	24.4	29.5	33.3	29.1	24.4	29.5	33.3	29.1
8	% Success	75.0	74.0	70.0	73.0	77.0	74.0	70.0	73.7	77.0	74.0	70.0	73.7	77.0	74.0	70.0	73.7	77.0	74.0	70.0	73.7
	% False +	28.8	28.6	32.8	30.0	22.0	23.2	27.6	24.3	22.0	23.2	27.6	24.3	22.0	23.2	27.6	24.3	22.0	23.2	27.6	24.3
	% False -	19.5	22.7	26.2	22.8	24.4	29.5	33.3	29.1	24.4	29.5	33.3	29.1	24.4	29.5	33.3	29.1	24.4	29.5	33.3	29.1
9	% Success	75.0	74.0	70.0	73.0	78.0	77.0	73.0	76.0	75.0	74.0	72.0	73.7	77.0	76.0	74.0	75.7	76.0	75.0	71.0	74.0
	% False +	28.8	28.6	32.8	30.0	15.3	14.3	19.0	16.2	18.6	17.9	20.7	19.1	15.3	14.3	17.2	15.6	18.6	17.9	22.4	19.6
	% False -	19.5	22.7	26.2	22.8	31.7	34.1	38.1	34.6	34.1	36.4	38.1	36.2	34.1	36.4	38.1	36.2	31.7	34.1	38.1	34.6

Table 6-9. Tier 2 Decision Rule Successes/Failures for Weighting Scenario 1

Run No.	DR5				DR6				DR7				DR8				DR9			
	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
1	F+	F+	F+		S	S	S		S	S	S		S	S	S		S	S	S	
2	F+	F+	F+		F+	F+	F+		S	S	S		S	S	S		F+	F+	F+	
3	F+	F+	F+		S	S	S		S	S	S		S	S	S		S	S	S	
4	SC	SC	SC		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
5	SC	SC	F+		F-	F-	S		F-	F-	S		F-	F-	S		F-	F-	S	
6	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
7	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
8	F+	F+	SC		F+	F+	SC		S	S	F-		S	S	F-		F+	F+	SC	
9	F-	S	S		F-	S	S		F-	S	S		F-	S	S		F-	S	S	
10	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
11	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
12	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
13	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
14	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
15	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
16																				
17	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
18	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
19	S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-	
20	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
21	S	S	F-		S	S	F-		S	S	F-		S	S	F-		S	S	F-	
22	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
23	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
24	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
25	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	

(continued)

Table 6-9. (continued)

	DR5				DR6				DR7				DR8				DR9			
Run No.	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
26	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
27	F+	F+	F+		S	S	S		F+	F+	F+		S	S	S		F+	F+	F+	
28	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
29	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
30	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
31	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
32	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
33	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
34																				
35	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
36	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
37	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
38	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
39	SC	SC	SC		F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC	
40	SC	SC	SC		SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC	
41	SC	SC	SC		F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC	
42	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
43																				
44	SC	SC	F+		SC	SC	F+		SC	SC	F+		SC	SC	F+		SC	SC	F+	
45	F+	F+	F+		S	S	S		S	S	S		S	S	S		S	S	S	
46	SC	SC	SC		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
47	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
48	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
49	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
50	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
51	F-	F-	S		F-	F-	S		F-	F-	S		F-	F-	S		F-	F-	S	

(continued)

Table 6-9. (continued)

Run No.	DR5				DR6				DR7				DR8				DR9			
	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
52																				
53	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
54	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
55	F+	F+	F+		S	S	S		S	S	S		S	S	S		S	S	S	
56	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
57	SC	SC	SC		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
58	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
59	SC	SC	SC		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
60	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
61	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
62	SC	SC	SC		SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC	
63	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
64	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
65	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
66	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
67	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
68	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
69	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
70																				
71	S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-	
72	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
73	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
74	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
75	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
76	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
77	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	

(continued)

Table 6-9. (continued)

Run No.	DR5				DR6				DR7				DR8				DR9			
	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg	90th %	95th %	99th %	% Avg
78	F+	SC	SC		F+	SC	SC		F+	SC	SC		F+	SC	SC		F+	SC	SC	
79	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
80	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
81	SC	SC	SC		F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC	
82	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
83	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
84	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
85	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
86	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
87	F+	SC	F+		F+	SC	F+		F+	SC	F+		F+	SC	F+		F+	SC	F+	
88																				
89	S	S	S		S	S	S		S	S	S		S	S	S		S	S	S	
90	F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-		F-	F-	F-	
91	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
92	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
93	SC	SC	SC		F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC	
94	SC	SC	SC		SC	SC	SC		F-	F-	F-		F-	F-	F-		SC	SC	SC	
95	SC	SC	SC		F-	F-	F-		SC	SC	SC		F-	F-	F-		SC	SC	SC	
96	S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-		S	F-	F-	
97																				
98	F+	F+	F+		S	S	S		S	S	S		S	S	S		S	S	S	
99	SC	F+	F+		F-	S	S		SC	F+	F+		F-	S	S		SC	F+	F+	
100	F+	F+	F+		S	S	S		S	S	S		S	S	S		S	S	S	
101	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
102	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
103	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	

(continued)

Table 6-9. (continued)

	DR5				DR6				DR7				DR8				DR9			
Run No.	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**	**90th %**	**95th %**	**99th %**	**% Avg**
104	SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC		SC	SC	SC	
105	S	S	F-		S	S	F-		S	S	F-		S	S	F-		S	S	F-	
106																				
107	SC	SC	F+		SC	SC	F+		F-	F-	S		F-	F-	S		SC	SC	F+	
108	F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+		F+	F+	F+	
# SC:	33	34	31		22	24	22		24	25	23		18	20	18		28	29	27	
# S:	42	40	39		49	48	48		50	48	48		51	50	50		48	46	46	
% SC or S:	75	74	70	73	71	72	70	71	74	73	71	73	69	70	68	69	76	75	73	75
# F+ Failures:	17	16	19		10	8	10		9	8	10		8	6	8		11	10	12	
% F+ Failures	29	29	33	30	17	14	17	16	15	14	17	16	14	11	14	13	19	18	21	19
# F- Failures:	8	10	11		19	20	20		17	19	19		23	24	24		13	15	15	
% F- Failures:	20	23	26	23	46	45	48	46	41	43	45	43	56	55	57	56	32	34	36	34
check #:	100	100	100		100	100	100		100	100	100		100	100	100		100	100	100	

megavariable information and the various scores and counts with respect to false positive errors. It is also noted, however, that Decision Rule 5 has the lowest false negative error rate (23 percent).

Indeed, the relative performances of the five decision rules in Table 6-8 are so varied that a clearly superior decision rule (superior with respect to success rate and both types of errors) does not emerge. In addition, several have identical results,[3] e.g., Decision Rules 6–9 for Weighting Scenarios 7 and 8. Furthermore, we also note from Table 6-8 that a relatively high success rate can be paired with error rates that are far from balanced. For example, the highest success rate (averaged over percentiles) in Table 6-8 (Weighting Scenario 9 with Decision Rule 6) has a 76 percent success rate coupled with a relatively low false positive rate (16.2 percent) but a relatively high false negative rate (34.6 percent).

Given these mixed results among the five candidate decision rules, we then attempted to modify Decision Rules 6–9 so that the two types of error rates would be more balanced, hopefully without sacrificing too much with respect to success rates. (EPA has expressed the goal that the two types of errors should be, ideally, approximately equal to balance economic and environmental/health concerns.) These modifications were made with the introduction of “safety factors” into the decision rules.

Two types of safety factors were introduced. The first type modifies the normalized Grand Score threshold value (currently 0) while the second type modifies the predicted P2 MOE/true P1 MOE ratio’s threshold value (currently 1.0). For example, Decision Rule 8 can be written as

IF normalized Grand Score < SF1 AND Count “-1” > Count “+1”
AND predicted P2 MOE/true P1 MOE < SF2 THEN reject H0

where SF1 and SF2 are now user-specified threshold values (safety factors). Increasing either or both safety factors above their current values of 0 and 1 will tend to increase the subpopulation of comparisons that meet (at least part of) the decision rules’ criteria and are eligible for a rejection of H0. Thus, more false positive errors are possible. However, this increase in false positives will tend to be offset by a decrease in false negatives. (More overall rejections of H0 will lead to fewer failures to reject H0 when it is true.) Thus, increases in either SF1 or SF2 will tend to decrease false negative rates and increase false positive rates. Because the converse is also true, SF1 and SF2 are then effectively calibration parameters by which the decision rules can be adjusted in an attempt to balance the two types of errors while hopefully preserving a relatively high success rate. (Note that SF1 is not relevant to Decision Rule 7 because it does not use the normalized Grand Score.)

[3] These identical results reflect both the characteristics of the available cross-validation data and the fact that some of the decision rules’ conditions (e.g., normalized Grand Score < 0) are binary (e.g., less than zero or not) and therefore not sensitive to minor differences in the Grand Score or counts. Therefore, if two weighting scenarios had, for example, normalized Grand Score results that were identically paired with respect to whether they are less than zero, but have otherwise different numerical values, they would be seen as identical by the decision rules.

We then attempted to optimize the values of SF1 and SF2 by trying many alternative combinations and finding a combination that resulted in a relatively high success rate and balanced, relatively low error rates for both types of errors. Although several combinations were found that gave roughly comparable results, the best overall performance was judged to result from Decision Rule 9 with Weighting Scenario 7 and SF1 = 0.02 and SF2 = 1.0 (as before). With these specifications, the average success rate across percentiles was 75 percent with a 25 percent error rate for both false positives and false negatives.

6.5 Summary and Conclusions

The decision rules evaluated in this cross-validation analysis clearly have predictive power, i.e., their rates at successfully identifying comparisons where true P2 MOE < true P2 MOE are significantly better than a no-information “coin toss.” Judging from the results of this analysis, we recommend that Decision Rule 9 with Weighting Scenario 7 and SF1 = 0.02 and SF2 = 1.0 be used in the comparative analyses because the success rate is relatively high and the false positive and false negative error rates are well-balanced. Expressing this decision rule in terms appropriate for the comparative analyses (as opposed to the cross-validation analyses discussed herein), the rule is

> *IF GrandScore/Reliability < 0.02 OR Count “-1” > Count “+1” AND (Predicted P2 MOE/true P1 MOE) < 1.0 AND Predicted P2 MOE < 1 THEN reject H0 where H0: P2 (i.e., actual P2 or “New P1”) MOE >= 1.*

Based on this cross-validation analysis, use of this decision rule would be expected to be successful in approximately 75 percent of all comparisons made. Success occurs when a false H0 is rejected (explicit success) or a true H0 is not rejected (implicit success). False positive error rates (rejecting H0 when it is true) would be expected to occur for approximately 25 percent of those comparisons for which H0 is in fact true. False negative error rates (accepting H0 when it is false) would be expected to occur for approximately 25 percent of those comparisons for which H0 is in fact true based on these results.

7.0 Results of Comparative Analysis

The results of the weight-of-evidence methodology, based on Decision Rule 9 and megavariable Weighting Scenario 7 with SF1 = 0.02 and SF2 = 1.0 as discussed in Section 6, for EPA's preferred MACT option (and the regulatory baseline) are presented here. Results for the other options that EPA considered are given in Appendix D. The objective here is to compare the proposed MACT option to the 1999 MACT standards using the variables discussed in Section 3, in order to assist EPA in determining whether the risks might be expected to be lower than, about the same as, or higher than the risks found in the original risk assessment for the 1999 rule. The analysis is carried out on a pollutant by pollutant basis for each of the New Phase I/Phase II source categories. In those instances where the weight-of-evidence analysis suggests the risks could be higher than those modeled previously, the MOE procedure is used to provide further insight into whether the risks could approach (or possibly exceed) a level of concern, as defined by EPA.

The complete list of MACT options is

- Option 1 Floor SDL
- Option 1D SDL (beyond-the-floor)
- Option 2 Floor SDL
- Option 2D SDL (beyond-the-floor)
- Option 3 Floor SDL
- Option 3D SDL (beyond-the-floor).

SDL (statistical design level) refers to the method by which EPA projected emissions under each of the options.[1] In the current rule, Option 1D is EPA's proposed option, with the exception of hydrochloric acid and chlorine, where EPA is proposing the Option 1 Floor. For each of the six MACT options, comparisons included chemical emission rates at both the projected baseline and MACT standard conditions. For the Phase I sources, the baseline is the emissions projected to occur under the 2002 interim standards rule (67 FR 6792). For the Phase II sources, the baseline is the current emissions of these sources as represented in EPA's database, which reflects the performance of these sources under the 1991 boiler and industrial furnace (BIF) rule. See the EPA background document, *Technical Support Document for HWC MACT Replacement Standards, Volume V: Emission Estimates and Engineering Costs* (March 2004), for a description of the methods used for projecting emissions. For each of the six MACT

[1] Note that EPA used design levels of 50 percent and 70 percent of the MACT standards to project emissions for the 1999 final rule analyses (64 FR 52828). The 70 percent design level emission projections were used in EPA's risk assessment for the 1999 final rule. Under the SDL approach, which considers the variability of the best performing sources, emissions are capped at 70 percent of the standard. The old Phase I 70 percent and Phase II/New Phase I SDL emission projections were used in the comparisons described here.

options, comparisons included chemical emission rates at both the projected baseline and MACT standard conditions.

The chemical emissions analyzed are provided in the following list; the abbreviations included are used as chemical identifiers in subsequent tables:

- Chlorinated dioxins and furans (TEQ)[2]
- Mercury (HG)
- Cadmium (CD)
- Lead (PB)
- Arsenic (AS)
- Beryllium (BE)
- Chromium + 6 (CR_6)
- Chromium + 3 (CR_3)
- Chlorine (CL2)
- Hydrogen chloride (HCL)
- Antimony (SB)
- Nickel (NI)
- Selenium (SE)
- Barium (BA)
- Thallium (TL)
- Particulate matter (PM).

The combustor categories compared are presented in Table 7-1. The Phase II or New Phase I subcategory disaggregation (e.g., dry APCD Phase II LB) shown in Table 7-1 were of interest only for dioxin and furan TEQ.

Table 7-1. Old Phase I and Phase II/New Phase I Combustor Categories Compared

Old Phase I Category	Phase II or New Phase I Category (All Chemicals)	Phase II or New Phase I Subcategory (TEQ Only)
All Incinerators	Phase II LB	
All Incinerators	Phase II LB	Dry APCD
All Incinerators	Phase II LB	Wet or no APCD
All Incinerators	Phase II SB	
All Incinerators	Phase II SB and LB	
All Incinerators	Phase II HAF	

(continued)

[2] Note that for chlorinated dioxins and furans (TEQ), the year 2000 EPA cancer slope factor (1E-03 risk per picogram/kilogram BW/day) was used in the comparisons. EPA's 1985 slope factor (1.56E-04 risk per picogram/kilogram BW/day) is a factor of 6 lower than the 2000 slope factor. However, this affects only the MOE calculations, and does not otherwise affect the comparisons.

Table 7-1. (continued)

Old Phase I Category	Phase II or New Phase I Category (All Chemicals)	Phase II or New Phase I Subcategory (TEQ Only)
All Incinerators	New Phase I All Incinerators	
All Incinerators	New Phase I All Incinerators	Dry APCD or WHB
All Incinerators	New Phase I All Incinerators	Wet or no APCD and no WHB
CK	New Phase I CK	
LWAK	New Phase I LWAK	
CK and LWAK	New Phase I CK and LWAK	

A "comparison" consists of a selection for each of the following: (1) chemical, (2) MACT option, (3) baseline or MACT emission scenario, (4) Old Phase I category, (5) Phase II or New Phase I Category, and (6) Phase II or New Phase I Subcategory (dioxins and furans only). RelRisk was run for all of the comparisons among these selections. The RelRisk results (scores, counts, reliability results, and Phase II/New Phase I MOEs) for MACT Option 1 Floor SDL and MACT Option 1D SDL (beyond-the-floor controls) are presented in Tables 7-2 and 7-3,[3] respectively, for all pollutants except PM (non-PM). Non-PM results for the remaining four options are presented in Appendix D. PM results for Option 1 Floor and Option 1D are provided in Appendix E. Note that baseline emission rates for Phase II categories/subcategories are common among the three floor options (Option 1 Floor SDL, Option 2 Floor SDL, and Option 3 Floor SDL) but may vary among floor options for New Phase I sources.

The across-megavariable, weighted aggregations for all comparisons were then postprocessed in accordance with the selected megavariable weighting scenario and decision rule. As described in Section 6, the selected megavariable weights are

- Emissions: 2
- Stack: 0
- Meteorological: 1
- Population: 1

For purposes of the comparative analysis (and to be consistent with the MOE analysis described in Section 5.5), the decision rule from Section 6.5 is restated as follows:

IF GrandScore/Reliability < 0.02   OR   Count "-1" > Count "+1"

AND (P2 UCL / P1 UCL) emission ratio > 1.0

AND (P2 UCL / P1 UCL) emission ratio > Old Phase I MOE,

THEN reject H0, where H0: Phase II or New Phase I MOE >= 1.0.

[3] Note that Tables 7-2 and 7-3 are too wide to fit on one page so are each presented in two parts.

For each comparison for which H0 was rejected, i.e., a Phase II/New Phase I potential risk of concern is inferred to exist, a “threshold exceedance ratio” was calculated for the 90th, 95th, and/or 99th MOE percentile that resulted in the H0 rejection. The threshold exceedance ratio is defined such that a value exceeding 1.0 implies that the “predicted” Phase II MOE is less than 1.0 (i.e., Phase II risk of concern) and vice versa. The degree to which the threshold ratio exceeds 1.0 attempts to quantify, at least under the simplifying assumption that only emission rates affect risk, the degree to which Phase II/New Phase I risks might be of concern. For example, a threshold ratio of 10 would imply a risk of possibly an order of magnitude above a regulatory level of concern. The results of the application of the decision rule as given by the threshold ratios are presented in the last three columns of Tables 7-2 and 7-3. Any comparison for which the threshold exceedance exceeds 1.0 (only ratios >= 1.0 are shown) represent Phase II/New Phase I risks of potential concern.[4]

[4] We examined those instances in which the (P2 UCL/P1 UCL) emission ratios were unavailable due to insufficient data where the alternate decision rule, GS/Rel <0.02 AND CountM1 > CountP1, would otherwise identify P2 risk. (We chose the AND condition rather than OR because the cross-validation analysis showed this form to perform better when the “predicted” P2 MOE / true P1 MOE ratio is not considered in the decision rule.) This occurred only for the SB category for selenium. In these instances, we calculated the P2ucl/P1ucl ratio using the (single) SB emissions data point available for each of the MACT options and compared them to the 90th, 95th, and 99th percentile “threshold” ratios. The highest of these ratios to the threshold ratios were 0.009, 0.013, and 0.027 for the 90th, 95th, and 99th percentiles, respectively. Because these ratios are much less than 1, we conclude that the SB emissions for selenium are insufficient to trigger a risk concern under any of the MACT options. (For the baseline comparisons, there were no instances in which the P2ucl/P1ucl ratios were unavailable that satisfied the condition GS/Rel <0.02 AND CountM1 > CountP1.)

Table 7-2a. RelRisk Outputs for Weighting Scenario 7 and Results of Decision Rule 9 for Option 1 Floor SDL (Part 1 of 2)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
1	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	TEQ	0.10	1.6	0.06
2	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	HG	0.35	1.2	0.29
3	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	CD	0.29	1.2	0.24
4	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	PB	0.35	1.2	0.29
5	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	AS	-0.15	1.2	-0.13
6	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	BE	-0.20	1.2	-0.17
7	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	CR_6	-0.10	1.6	-0.06
8	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	CR_3	0.15	2.1	0.07
9	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	CL2	0.13	1.6	0.08
10	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	HCL	-0.15	1.4	-0.11
11	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	SB	0.05	1.2	0.04
12	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	NI	-0.15	1.6	-0.09
13	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	SE	-0.15	1.6	-0.09
14	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	BA	-0.15	1.3	-0.11
15	OPT 1 FLOOR SDL	MACT	INCIN	P2_LB	TL	-0.15	1.3	-0.11
16	OPT 1 FLOOR SDL	MACT	INCIN	P2_DRY_LB	TEQ	0.14	2.7	0.05
17	OPT 1 FLOOR SDL	MACT	INCIN	P2_NOTDRY_LB	TEQ	0.09	1.7	0.05
18	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	TEQ	0.00	2.5	0.00
19	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	HG	-0.25	2.8	-0.09
20	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	CD	-0.25	2.8	-0.09
21	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	PB	0.00	3.0	0.00
22	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	AS	0.00	3.0	0.00

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
23	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	BE	0.00	2.0	0.00
24	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	CR_6	0.00	2.0	0.00
25	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	CR_3	0.00	2.0	0.00
26	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	CL2	0.00	2.0	0.00
27	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	HCL	-0.50	1.5	-0.33
28	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	SB	-0.25	2.8	-0.09
29	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	NI	-0.50	2.0	-0.25
30	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	SE	-0.50	2.0	-0.25
31	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	BA	-0.25	2.8	-0.09
32	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB	TL	-0.25	2.8	-0.09
33	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	TEQ	0.04	3.1	0.01
34	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	HG	0.05	3.1	0.02
35	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	CD	0.00	3.3	0.00
36	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	PB	0.23	3.0	0.08
37	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	AS	0.00	3.3	0.00
38	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	BE	0.00	3.3	0.00
39	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	CR_6	-0.50	2.0	-0.25
40	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	CR_3	-0.50	2.0	-0.25
41	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	CL2	0.05	2.9	0.02
42	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	HCL	0.25	2.5	0.10
43	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	SB	0.08	2.8	0.03
44	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	NI	-0.25	2.8	-0.09
45	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	SE	-0.30	3.1	-0.10

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
46	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	BA	0.00	3.3	0.00
47	OPT 1 FLOOR SDL	MACT	INCIN	P2_HAF	TL	-0.30	2.6	-0.11
48	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	TEQ	-0.01	1.6	-0.01
49	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	HG	-0.25	1.3	-0.19
50	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	CD	0.25	1.2	0.21
51	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	PB	0.25	1.2	0.21
52	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	AS	0.00	1.4	0.00
53	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	BE	0.00	1.4	0.00
54	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	CR_6	-0.05	1.6	-0.03
55	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	CR_3	0.20	1.3	0.15
56	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	CL2	0.23	1.2	0.19
57	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	HCL	0.30	1.2	0.25
58	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	SB	0.00	1.6	0.00
59	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	NI	0.25	1.4	0.18
60	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	SE	0.00	1.9	0.00
61	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	BA	0.00	1.6	0.00
62	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_INCIN	TL	0.00	1.6	0.00
63	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_DRY_INCIN	TEQ	-0.33	2.5	-0.13
64	OPT 1 FLOOR SDL	MACT	INCIN	NEW_P1_NOTDRY_INCIN	TEQ	0.00	1.8	0.00
65	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	TEQ	0.43	2.9	0.15
66	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	HG	0.29	2.9	0.10
67	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	CD	-0.01	3.8	0.00

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
68	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	PB	-0.01	3.8	0.00
69	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	AS	0.24	3.3	0.07
70	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	BE	0.24	3.1	0.08
71	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	CR_6	-0.01	3.8	0.00
72	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	CR_3	0.24	3.1	0.08
73	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	CL2	-0.01	3.8	0.00
74	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	HCL	0.29	3.4	0.08
75	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	SB	-0.01	3.8	0.00
76	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	NI	-0.01	3.8	0.00
77	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	SE	-0.01	3.8	0.00
78	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	BA	-0.01	3.8	0.00
79	OPT 1 FLOOR SDL	MACT	CK	NEW_P1_CK	TL	-0.01	3.8	0.00
80	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	TEQ	-0.50	1.5	-0.33
81	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	HG	0.00	2.0	0.00
82	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	CD	0.50	1.5	0.33
83	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	PB	0.00	2.0	0.00
84	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	AS	0.00	2.0	0.00
85	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	BE	0.00	2.0	0.00
86	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	CR_6	0.00	2.0	0.00
87	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	CR_3	0.00	2.0	0.00
88	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	CL2	0.00	2.0	0.00
89	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	HCL	-0.50	1.5	-0.33
90	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	SB	0.50	1.5	0.33

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
91	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	NI	0.00	2.0	0.00
92	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	SE	0.00	2.0	0.00
93	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	BA	0.00	2.0	0.00
94	OPT 1 FLOOR SDL	MACT	LWAK	NEW_P1_LWAK	TL	0.00	2.0	0.00
95	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	TEQ	0.10	1.6	0.06
96	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	HG	0.10	1.4	0.07
97	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	CD	0.04	1.4	0.03
98	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	PB	0.36	1.4	0.25
99	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	AS	-0.15	1.2	-0.13
100	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	BE	-0.20	1.2	-0.17
101	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	CR_6	0.10	1.9	0.05
102	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	CR_3	0.15	1.8	0.08
103	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	CL2	0.20	1.6	0.13
104	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	HCL	-0.15	1.4	-0.11
105	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	SB	-0.15	1.2	-0.13
106	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	NI	-0.15	1.5	-0.10
107	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	SE	-0.15	1.6	-0.09
108	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	BA	-0.15	1.2	-0.13
109	OPT 1 FLOOR SDL	MACT	INCIN	P2_SB_LB	TL	-0.15	1.2	-0.13
110	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	TEQ	0.13	3.5	0.04
111	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	HG	0.25	3.1	0.08
112	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CD	0.00	3.9	0.00
113	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	PB	-0.01	3.8	0.00

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
114	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	AS	0.00	3.9	0.00
115	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	BE	0.33	2.9	0.11
116	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CR_6	0.00	3.9	0.00
117	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CR_3	0.25	3.1	0.08
118	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CL2	0.00	3.9	0.00
119	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	HCL	-0.05	3.7	-0.01
120	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	SB	0.25	3.4	0.07
121	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	NI	0.00	3.9	0.00
122	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	SE	0.00	3.9	0.00
123	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	BA	0.00	3.9	0.00
124	OPT 1 FLOOR SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	TL	0.00	3.9	0.00
125	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	TEQ	0.35	1.7	0.20
126	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	HG	0.35	1.3	0.27
127	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	CD	0.35	1.3	0.27
128	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	PB	0.35	1.3	0.27
129	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	AS	-0.15	1.6	-0.10
130	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	BE	-0.20	1.3	-0.15
131	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	CR_6	0.10	2.2	0.04
132	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	CR_3	0.10	2.5	0.04
133	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	CL2	0.20	1.6	0.13
134	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	HCL	-0.15	1.5	-0.10
135	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	SB	0.10	1.8	0.06
136	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	NI	-0.15	1.7	-0.09

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
137	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	SE	-0.15	1.7	-0.09
138	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	BA	-0.15	1.6	-0.10
139	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_LB	TL	-0.15	1.6	-0.10
140	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_DRY_LB	TEQ	0.14	2.7	0.05
141	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_NOTDRY_LB	TEQ	0.29	1.7	0.17
142	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	TEQ	0.00	2.5	0.00
143	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	HG	0.00	3.0	0.00
144	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	CD	0.00	3.0	0.00
145	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	PB	0.00	3.0	0.00
146	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	AS	0.00	3.0	0.00
147	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	BE	0.00	2.0	0.00
148	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	CR_6	0.00	2.0	0.00
149	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	CR_3	0.00	2.0	0.00
150	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	CL2	0.00	2.0	0.00
151	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	HCL	-0.25	2.8	-0.09
152	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	SB	-0.25	2.8	-0.09
153	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	NI	0.00	2.0	0.00
154	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	SE	0.00	2.0	0.00
155	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	BA	-0.25	2.8	-0.09
156	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB	TL	-0.25	2.8	-0.09
157	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	TEQ	0.04	3.1	0.01
158	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	HG	0.25	2.8	0.09
159	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	CD	0.00	3.3	0.00

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
160	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	PB	0.23	2.7	0.08
161	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	AS	0.38	2.4	0.16
162	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	BE	0.25	2.8	0.09
163	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	CR_6	0.00	3.0	0.00
164	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	CR_3	0.00	3.0	0.00
165	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	CL2	-0.20	2.8	-0.07
166	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	HCL	0.00	3.3	0.00
167	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	SB	0.08	2.8	0.03
168	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	NI	0.00	3.3	0.00
169	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	SE	-0.05	3.1	-0.02
170	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	BA	0.00	3.3	0.00
171	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_HAF	TL	-0.05	3.1	-0.02
172	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	TEQ	0.19	1.6	0.12
173	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	HG	0.25	1.3	0.19
174	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	CD	0.25	1.3	0.19
175	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	PB	0.25	1.3	0.19
176	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	AS	0.25	1.3	0.19
177	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	BE	0.20	1.6	0.13
178	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	CR_6	0.25	1.7	0.14
179	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	CR_3	0.25	1.7	0.14
180	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	CL2	0.28	1.6	0.18
181	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	HCL	0.25	1.2	0.21
182	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	SB	0.38	1.4	0.26

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
183	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	NI	0.30	1.7	0.18
184	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	SE	0.31	1.6	0.20
185	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	BA	0.31	1.6	0.19
186	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_INCIN	TL	0.25	1.8	0.14
187	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_DRY_INCIN	TEQ	-0.08	3.0	-0.02
188	OPT 1 FLOOR SDL	BASELINE	INCIN	NEW_P1_NOTDRY_ INCIN	TEQ	0.20	1.7	0.12
189	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	TEQ	0.43	2.9	0.15
190	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	HG	-0.01	3.8	0.00
191	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	CD	0.24	3.1	0.08
192	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	PB	0.24	3.1	0.08
193	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	AS	-0.01	3.8	0.00
194	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	BE	0.24	3.1	0.08
195	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	CR_6	-0.01	3.8	0.00
196	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	CR_3	0.24	3.1	0.08
197	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	CL2	-0.01	3.8	0.00
198	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	HCL	0.29	3.4	0.08
199	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	SB	-0.01	3.8	0.00
200	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	NI	0.24	3.6	0.07
201	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	SE	-0.01	3.8	0.00
202	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	BA	-0.01	3.8	0.00
203	OPT 1 FLOOR SDL	BASELINE	CK	NEW_P1_CK	TL	-0.01	3.8	0.00
204	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	TEQ	0.00	2.0	0.00

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
205	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	HG	0.00	2.0	0.00
206	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	CD	0.50	1.5	0.33
207	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	PB	0.00	2.0	0.00
208	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	AS	0.00	2.0	0.00
209	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	BE	0.00	2.0	0.00
210	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	CR_6	0.00	2.0	0.00
211	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	CR_3	0.00	2.0	0.00
212	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	CL2	0.50	1.5	0.33
213	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	HCL	0.50	1.5	0.33
214	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	SB	0.50	1.5	0.33
215	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	NI	0.00	2.0	0.00
216	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	SE	0.00	2.0	0.00
217	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	BA	0.00	2.0	0.00
218	OPT 1 FLOOR SDL	BASELINE	LWAK	NEW_P1_LWAK	TL	0.00	2.0	0.00
219	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	TEQ	0.35	1.7	0.20
220	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	HG	0.35	1.3	0.27
221	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	CD	0.35	1.3	0.27
222	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	PB	0.36	1.3	0.28
223	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	AS	-0.15	1.6	-0.10
224	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	BE	-0.15	1.3	-0.11
225	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	CR_6	0.10	2.2	0.04
226	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	CR_3	0.10	2.2	0.04
227	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	CL2	0.20	1.6	0.13

(continued)

Table 7-2a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
228	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	HCL	-0.15	1.5	-0.10
229	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	SB	0.10	1.8	0.06
230	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	NI	-0.15	1.7	-0.09
231	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	SE	-0.15	1.7	-0.09
232	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	BA	-0.15	1.6	-0.10
233	OPT 1 FLOOR SDL	BASELINE	INCIN	P2_SB_LB	TL	-0.15	1.6	-0.10
234	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	TEQ	0.13	3.5	0.04
235	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	HG	0.00	3.9	0.00
236	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CD	0.25	3.1	0.08
237	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	PB	0.24	3.1	0.08
238	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	AS	0.00	3.9	0.00
239	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	BE	0.25	3.1	0.08
240	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CR_6	0.00	3.9	0.00
241	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CR_3	0.25	3.1	0.08
242	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CL2	0.25	3.4	0.07
243	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	HCL	0.25	3.1	0.08
244	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	SB	0.25	3.4	0.07
245	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	NI	0.00	3.9	0.00
246	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	SE	0.00	3.9	0.00
247	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	BA	0.00	3.9	0.00
248	OPT 1 FLOOR SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	TL	0.00	3.9	0.00

Table 7-2b. RelRisk Outputs for Weighting Scenario 7 and Results of Decision Rule 9 for Option 1 Floor SDL (Part 2 of 2)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
1	0.83	0.03	0.01	0.13	0.00	3.0E+00	8.0E+00	4.0E+00	1.7E+00			
2	0.60	0.28	0.01	0.12	0.00	3.2E-01	3.0E+02	1.0E+02	5.0E+01			
3	0.58	0.28	0.03	0.12	0.00	1.2E-01	5.0E+03	2.5E+03	5.0E+02			
4	0.59	0.28	0.01	0.12	0.00	3.6E-01	5.0E+02	5.0E+02	3.0E+02			
5	0.55	0.03	0.26	0.17	0.00	4.3E+01	5.0E+02	5.0E+02	5.0E+02			
6	0.56	0.03	0.28	0.13	0.00	7.9E+00	2.0E+04	1.0E+04	1.0E+04			
7	0.58	0.04	0.26	0.12	0.00	3.1E+01	2.0E+03	1.0E+03	2.0E+02			
8	0.83	0.04	0.01	0.12	0.00	4.0E+00	1.0E+07	1.0E+07	5.0E+06			
9	0.78	0.06	0.03	0.13	0.00	3.4E+00	2.0E+02	6.0E+01	1.0E+01			
10	0.60	0.03	0.26	0.12	0.00	3.2E+01	1.0E+03	1.0E+03	5.0E+02			
11	0.83	0.03	0.03	0.12	0.00	1.2E+00	3.0E+02	3.0E+02	1.0E+02			
12	0.58	0.03	0.26	0.13	0.00	4.3E+01	3.0E+04	1.0E+04	5.0E+03			
13	0.60	0.03	0.26	0.12	0.00	2.7E+01	3.0E+04	2.0E+04	1.0E+04			
14	0.58	0.03	0.26	0.13	0.00	6.4E+03	5.0E+04	3.0E+04	1.0E+04			
15	0.58	0.03	0.26	0.13	0.00	2.7E+02	3.0E+04	2.0E+03	1.0E+03			
16	0.56	0.04	0.06	0.06	0.28	9.2E+00	8.0E+00	4.0E+00	1.7E+00	1.2E+00	2.3E+00	5.4E+00
17	0.80	0.03	0.01	0.16	0.00	1.8E+00	8.0E+00	4.0E+00	1.7E+00			
18	0.62	0.00	0.00	0.03	0.36	N/A	N/A	N/A	N/A			
19	0.52	0.00	0.25	0.03	0.21	4.7E+01	3.0E+02	1.0E+02	5.0E+01			
20	0.52	0.00	0.25	0.03	0.21	2.7E+02	5.0E+03	2.5E+03	5.0E+02			
21	0.77	0.00	0.00	0.03	0.21	1.2E+02	5.0E+02	5.0E+02	3.0E+02			
22	0.75	0.00	0.00	0.03	0.23	3.5E+02	5.0E+02	5.0E+02	5.0E+02			

(continued)

Table 7-2b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE UCL2/UCL1 Threshold	95% MOE UCL2/UCL1 Threshold	99% MOE UCL2/UCL1 Threshold	Threshold Ratio > 1 90% MOE	Threshold Ratio > 1 95% MOE	Threshold Ratio > 1 99% MOE
23	0.60	0.00	0.00	0.03	0.37	6.4E+02	2.0E+04	1.0E+04	1.0E+04			
24	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
25	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
26	0.60	0.00	0.00	0.03	0.37	2.8E+01	2.0E+02	6.0E+01	1.0E+01			2.8E+00
27	0.35	0.00	0.25	0.03	0.37	7.0E+02	1.0E+03	1.0E+03	5.0E+02			1.4E+00
28	0.52	0.00	0.25	0.03	0.21	9.3E+02	3.0E+02	3.0E+02	1.0E+02	3.1E+00	3.1E+00	9.3E+00
29	0.30	0.00	0.25	0.03	0.42	2.0E+02	3.0E+04	1.0E+04	5.0E+03			
30	0.30	0.00	0.25	0.03	0.42	N/A	N/A	N/A	N/A			
31	0.52	0.00	0.25	0.03	0.21	1.4E+04	5.0E+04	3.0E+04	1.0E+04			1.4E+00
32	0.52	0.00	0.25	0.03	0.21	3.7E+03	3.0E+04	2.0E+03	1.0E+03		1.9E+00	3.7E+00
33	0.84	0.02	0.01	0.13	0.00	2.0E+02	8.0E+00	4.0E+00	1.7E+00	2.5E+01	5.0E+01	1.2E+02
34	0.82	0.02	0.00	0.16	0.00	1.8E+00	3.0E+02	1.0E+02	5.0E+01			
35	0.86	0.00	0.00	0.14	0.00	1.8E+01	5.0E+03	2.5E+03	5.0E+02			
36	0.61	0.25	0.01	0.13	0.00	7.9E-01	5.0E+02	5.0E+02	3.0E+02			
37	0.86	0.00	0.00	0.14	0.00	4.1E+00	5.0E+02	5.0E+02	5.0E+02			
38	0.82	0.00	0.00	0.18	0.00	3.9E+00	2.0E+04	1.0E+04	1.0E+04			
39	0.34	0.00	0.25	0.14	0.27	4.9E+00	2.0E+03	1.0E+03	2.0E+02			
40	0.34	0.00	0.25	0.14	0.27	2.1E+00	1.0E+07	1.0E+07	5.0E+06			
41	0.80	0.02	0.00	0.18	0.00	4.8E+00	2.0E+02	6.0E+01	1.0E+01			
42	0.61	0.25	0.00	0.14	0.00	3.0E-01	1.0E+03	1.0E+03	5.0E+02			
43	0.73	0.04	0.02	0.19	0.02	6.5E+00	3.0E+02	3.0E+02	1.0E+02			
44	0.61	0.00	0.25	0.14	0.00	2.3E+01	3.0E+04	1.0E+04	5.0E+03			
45	0.54	0.00	0.27	0.19	0.00	2.0E+02	3.0E+04	2.0E+04	1.0E+04			
46	0.86	0.00	0.00	0.14	0.00	2.6E+02	5.0E+04	3.0E+04	1.0E+04			

(continued)

Table 7-2b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
47	0.59	0.00	0.27	0.14	0.00	7.3E+00	3.0E+04	2.0E+03	1.0E+03			
48	0.98	0.00	0.00	0.02	0.00	1.3E+00	8.0E+00	4.0E+00	1.7E+00			
49	0.74	0.00	0.25	0.01	0.00	1.5E+00	3.0E+02	1.0E+02	5.0E+01			
50	0.74	0.25	0.00	0.01	0.00	2.2E-01	5.0E+03	2.5E+03	5.0E+02			
51	0.74	0.25	0.00	0.01	0.00	1.5E-01	5.0E+02	5.0E+02	3.0E+02			
52	0.99	0.00	0.00	0.01	0.00	1.5E+00	5.0E+02	5.0E+02	5.0E+02			
53	0.99	0.00	0.00	0.01	0.00	1.5E+00	2.0E+04	1.0E+04	1.0E+04			
54	0.95	0.00	0.02	0.03	0.00	1.8E+00	2.0E+03	1.0E+03	2.0E+02			
55	0.72	0.25	0.02	0.01	0.00	7.9E-01	1.0E+07	1.0E+07	5.0E+06			
56	0.70	0.27	0.02	0.01	0.00	3.8E-02	2.0E+02	6.0E+01	1.0E+01			
57	0.72	0.27	0.00	0.01	0.00	2.8E-02	1.0E+03	1.0E+03	5.0E+02			
58	0.99	0.00	0.00	0.01	0.00	9.9E-01	3.0E+02	3.0E+02	1.0E+02			
59	0.74	0.25	0.00	0.01	0.00	9.3E-01	3.0E+04	1.0E+04	5.0E+03			
60	0.99	0.00	0.00	0.01	0.00	2.5E+00	3.0E+04	2.0E+04	1.0E+04			
61	0.99	0.00	0.00	0.01	0.00	1.2E+00	5.0E+04	3.0E+04	1.0E+04			
62	0.99	0.00	0.00	0.01	0.00	7.7E-01	3.0E+04	2.0E+03	1.0E+03			
63	0.70	0.00	0.27	0.03	0.00	3.1E+00	8.0E+00	4.0E+00	1.7E+00			1.8E+00
64	0.91	0.00	0.00	0.09	0.00	1.3E+00	8.0E+00	4.0E+00	1.7E+00			
65	0.69	0.31	0.00	0.00	0.00	4.7E-01	1.7E+00	8.0E-01	3.0E-01			
66	0.73	0.27	0.00	0.00	0.00	6.3E-01	5.0E+00	3.0E+00	1.7E+00			
67	0.99	0.00	0.00	0.00	0.00	1.0E+00	2.0E+03	1.0E+03	5.0E+02			
68	0.98	0.00	0.00	0.02	0.00	7.8E-01	5.0E+02	5.0E+02	3.0E+02			
69	0.74	0.25	0.00	0.00	0.00	3.6E-01	2.0E+03	1.0E+03	1.0E+03			
70	0.74	0.25	0.00	0.00	0.00	1.1E-01	3.0E+04	2.0E+04	1.0E+04			

(continued)

Table 7-2b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE UCL2/UCL1 Threshold	95% MOE UCL2/UCL1 Threshold	99% MOE UCL2/UCL1 Threshold	Threshold Ratio > 1 90% MOE	Threshold Ratio > 1 95% MOE	Threshold Ratio > 1 99% MOE
71	0.94	0.00	0.00	0.05	0.00	7.1E-01	1.0E+04	1.0E+04	5.0E+03			
72	0.74	0.25	0.00	0.00	0.00	1.8E-01	5.0E+06	2.0E+06	1.0E+06			
73	0.96	0.00	0.00	0.04	0.00	6.3E-01	4.0E+01	2.0E+01	2.0E+01			
74	0.73	0.27	0.00	0.00	0.00	8.6E-01	3.0E+02	3.0E+02	2.0E+02			
75	0.99	0.00	0.00	0.00	0.00	3.6E-01	1.0E+03	1.0E+03	N/A			
76	0.96	0.00	0.00	0.04	0.00	4.6E-01	1.0E+04	5.0E+03	3.0E+03			
77	0.99	0.00	0.00	0.00	0.00	1.3E+00	2.0E+03	1.0E+03	1.0E+03			
78	0.99	0.00	0.00	0.00	0.00	1.1E+00	2.0E+03	1.0E+03	1.0E+03			
79	0.99	0.00	0.00	0.00	0.00	1.5E+00	5.0E+02	1.0E+02	5.0E+01			
80	0.25	0.00	0.25	0.00	0.50	1.0E+01	8.0E+00	3.0E+00	2.0E+00	1.3E+00	3.3E+00	5.0E+00
81	0.50	0.00	0.00	0.00	0.50	3.0E-01	5.0E+01	3.0E+01	N/A			
82	0.25	0.25	0.00	0.00	0.50	1.1E-01	5.0E+03	5.0E+03	2.0E+03			
83	0.50	0.00	0.00	0.00	0.50	4.1E-01	1.0E+03	1.0E+03	1.0E+03			
84	0.50	0.00	0.00	0.00	0.50	7.3E-01	5.0E+03	5.0E+03	2.0E+03			
85	0.50	0.00	0.00	0.00	0.50	3.8E-01	1.0E+05	5.0E+04	3.0E+04			
86	0.50	0.00	0.00	0.00	0.50	1.4E+00	5.0E+03	5.0E+03	1.0E+03			
87	0.50	0.00	0.00	0.00	0.50	6.3E-01	1.0E+07	3.0E+06	2.0E+06			
88	0.50	0.00	0.00	0.00	0.50	4.6E-01	2.0E+02	6.0E+01	6.0E+01			
89	0.25	0.00	0.25	0.00	0.50	2.5E+00	1.0E+02	1.0E+02	5.0E+01			
90	0.25	0.25	0.00	0.00	0.50	3.1E-02	1.0E+04	1.0E+04	1.0E+04			
91	0.50	0.00	0.00	0.00	0.50	2.6E-01	3.0E+03	1.0E+03	1.0E+03			
92	0.50	0.00	0.00	0.00	0.50	1.9E+00	3.0E+05	1.0E+05	1.0E+05			
93	0.50	0.00	0.00	0.00	0.50	3.3E-01	3.0E+04	2.0E+04	1.0E+04			
94	0.50	0.00	0.00	0.00	0.50	1.2E+00	3.0E+04	2.0E+04	5.0E+03			

(continued)

Table 7-2b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
95	0.83	0.03	0.01	0.14	0.00	2.8E+00	8.0E+00	4.0E+00	1.7E+00			
96	0.86	0.03	0.01	0.11	0.00	4.7E-01	3.0E+02	1.0E+02	5.0E+01			
97	0.84	0.03	0.03	0.11	0.00	3.3E-01	5.0E+03	2.5E+03	5.0E+02			
98	0.60	0.28	0.01	0.11	0.00	2.1E-01	5.0E+02	5.0E+02	3.0E+02			
99	0.59	0.03	0.26	0.13	0.00	4.3E+01	5.0E+02	5.0E+02	5.0E+02			
100	0.59	0.03	0.28	0.11	0.00	1.1E+01	2.0E+04	1.0E+04	1.0E+04			
101	0.86	0.03	0.01	0.11	0.00	9.7E+01	2.0E+03	1.0E+03	2.0E+02			
102	0.84	0.04	0.01	0.11	0.00	1.6E+02	1.0E+07	1.0E+07	5.0E+06			
103	0.82	0.06	0.01	0.11	0.00	3.4E+00	2.0E+02	6.0E+01	1.0E+01			
104	0.61	0.03	0.26	0.11	0.00	5.0E+01	1.0E+03	1.0E+03	5.0E+02			
105	0.61	0.03	0.26	0.11	0.00	6.0E+00	3.0E+02	3.0E+02	1.0E+02			
106	0.61	0.03	0.26	0.11	0.00	4.3E+01	3.0E+04	1.0E+04	5.0E+03			
107	0.61	0.03	0.26	0.11	0.00	2.7E+01	3.0E+04	2.0E+04	1.0E+04			
108	0.59	0.03	0.26	0.13	0.00	6.4E+03	5.0E+04	3.0E+04	1.0E+04			
109	0.59	0.03	0.26	0.13	0.00	2.7E+02	3.0E+04	2.0E+03	1.0E+03			
110	0.96	0.04	0.00	0.00	0.00	8.6E-01	1.7E+00	8.0E-01	3.0E-01			
111	0.75	0.25	0.00	0.00	0.00	6.3E-01	5.0E+00	3.0E+00	N/A			
112	1.00	0.00	0.00	0.00	0.00	9.4E-01	2.0E+03	1.0E+03	5.0E+02			
113	0.96	0.00	0.00	0.03	0.00	8.4E-01	5.0E+02	5.0E+02	3.0E+02			
114	1.00	0.00	0.00	0.00	0.00	5.7E-01	2.0E+03	1.0E+03	1.0E+03			
115	0.73	0.27	0.00	0.00	0.00	1.1E-01	3.0E+04	2.0E+04	1.0E+04			
116	0.98	0.00	0.00	0.02	0.00	2.9E-01	5.0E+03	5.0E+03	1.0E+03			
117	0.75	0.25	0.00	0.00	0.00	1.8E-01	5.0E+06	2.0E+06	1.0E+06			
118	0.96	0.00	0.00	0.04	0.00	8.3E-01	4.0E+01	2.0E+01	2.0E+01			

(continued)

Table 7-2b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	**CountZero**	**CountP1**	**CountM1**	**Count888**	**Count999**	**P2 UCL/ P1UCL**	**UCL2/UCL1 Threshold**	**UCL2/UCL1 Threshold**	**UCL2/UCL1 Threshold**	**90% MOE**	**95% MOE**	**99% MOE**
119	0.98	0.00	0.02	0.00	0.00	6.6E-01	1.0E+02	1.0E+02	5.0E+01			
120	0.75	0.25	0.00	0.00	0.00	5.1E+00	1.0E+03	1.0E+03	N/A			
121	0.96	0.00	0.00	0.03	0.00	4.6E-01	3.0E+03	1.0E+03	1.0E+03			
122	1.00	0.00	0.00	0.00	0.00	1.6E+00	2.0E+03	1.0E+03	1.0E+03			
123	1.00	0.00	0.00	0.00	0.00	7.2E-01	2.0E+03	1.0E+03	1.0E+03			
124	1.00	0.00	0.00	0.00	0.00	1.9E+00	5.0E+02	1.0E+02	5.0E+01			
125	0.58	0.28	0.01	0.13	0.00	1.3E-01	1.7E+00	8.0E-01	1.7E-01			
126	0.60	0.28	0.01	0.12	0.00	1.7E-01	3.0E+02	1.0E+02	5.0E+01			
127	0.60	0.28	0.01	0.12	0.00	5.0E-02	5.0E+02	5.0E+02	2.0E+01			
128	0.59	0.28	0.01	0.12	0.00	5.2E-02	1.0E+01	1.0E+01	8.0E+00			
129	0.60	0.03	0.26	0.12	0.00	1.8E+00	1.0E+02	1.0E+02	5.0E+01			
130	0.58	0.03	0.28	0.12	0.00	4.6E+00	1.0E+04	1.0E+04	3.0E+03			
131	0.85	0.03	0.01	0.12	0.00	4.2E+00	5.0E+02	1.0E+02	2.0E+01			
132	0.85	0.03	0.01	0.12	0.00	1.7E+00	3.0E+06	2.0E+06	1.0E+06			
133	0.78	0.06	0.01	0.15	0.00	1.1E+00	2.0E+01	2.0E+01	5.0E+00			
134	0.60	0.03	0.26	0.12	0.00	9.1E+00	1.0E+03	2.0E+02	1.0E+02			
135	0.83	0.03	0.01	0.13	0.00	6.8E-01	5.0E+01	5.0E+01	N/A			
136	0.60	0.03	0.26	0.12	0.00	9.5E+00	2.0E+04	1.0E+04	1.0E+03			
137	0.60	0.03	0.26	0.12	0.00	1.2E+01	3.0E+04	2.0E+04	1.0E+04			
138	0.56	0.03	0.26	0.15	0.00	3.3E+02	1.0E+04	5.0E+03	5.0E+03			
139	0.56	0.03	0.26	0.15	0.00	3.3E+01	1.0E+04	1.0E+03	1.0E+02			
140	0.56	0.04	0.06	0.06	0.28	4.7E+00	1.7E+00	8.0E-01	1.7E-01	2.8E+00	5.9E+00	2.8E+01
141	0.50	0.28	0.03	0.19	0.00	5.9E-02	1.7E+00	8.0E-01	1.7E-01			
142	0.62	0.00	0.00	0.03	0.36	N/A	N/A	N/A	N/A			

(continued)

Table 7-2b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE UCL2/UCL1 Threshold	95% MOE UCL2/UCL1 Threshold	99% MOE UCL2/UCL1 Threshold	Threshold Ratio > 1 90% MOE	Threshold Ratio > 1 95% MOE	Threshold Ratio > 1 99% MOE
143	0.77	0.00	0.00	0.03	0.21	7.7E+00	3.0E+02	1.0E+02	5.0E+01			
144	0.77	0.00	0.00	0.03	0.21	3.3E+01	5.0E+02	5.0E+02	2.0E+01			1.6E+00
145	0.77	0.00	0.00	0.03	0.21	1.3E+01	1.0E+01	1.0E+01	8.0E+00	1.3E+00	1.3E+00	1.7E+00
146	0.75	0.00	0.00	0.03	0.23	1.4E+02	1.0E+02	1.0E+02	5.0E+01	1.4E+00	1.4E+00	2.7E+00
147	0.60	0.00	0.00	0.03	0.37	2.8E+02	1.0E+04	1.0E+04	3.0E+03			
148	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
149	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
150	0.60	0.00	0.00	0.03	0.37	1.3E+01	2.0E+01	2.0E+01	5.0E+00			2.6E+00
151	0.50	0.00	0.25	0.03	0.23	2.0E+02	1.0E+03	2.0E+02	1.0E+02		1.0E+00	2.0E+00
152	0.52	0.00	0.25	0.03	0.21	7.9E+01	5.0E+01	5.0E+01	N/A	1.6E+00	1.6E+00	
153	0.55	0.00	0.00	0.03	0.42	1.7E+01	2.0E+04	1.0E+04	1.0E+03			
154	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
155	0.52	0.00	0.25	0.03	0.21	2.1E+03	1.0E+04	5.0E+03	5.0E+03			
156	0.52	0.00	0.25	0.03	0.21	1.8E+02	1.0E+04	1.0E+03	1.0E+02			1.8E+00
157	0.84	0.02	0.01	0.13	0.00	3.5E+01	1.7E+00	8.0E-01	1.7E-01	2.0E+01	4.3E+01	2.0E+02
158	0.59	0.25	0.00	0.16	0.00	3.2E-02	3.0E+02	1.0E+02	5.0E+01			
159	0.86	0.00	0.00	0.14	0.00	1.7E+00	5.0E+02	5.0E+02	2.0E+01			
160	0.61	0.25	0.01	0.13	0.00	4.6E-03	1.0E+01	1.0E+01	8.0E+00			
161	0.56	0.29	0.00	0.14	0.00	1.1E-01	1.0E+02	1.0E+02	5.0E+01			
162	0.55	0.25	0.00	0.19	0.00	2.3E-01	1.0E+04	1.0E+04	3.0E+03			
163	0.59	0.00	0.00	0.14	0.27	3.5E+00	5.0E+02	1.0E+02	2.0E+01			
164	0.59	0.00	0.00	0.14	0.27	8.0E-01	3.0E+06	2.0E+06	1.0E+06			
165	0.54	0.02	0.25	0.19	0.00	1.0E+01	2.0E+01	2.0E+01	5.0E+00			2.1E+00
166	0.86	0.00	0.00	0.14	0.00	1.9E+01	1.0E+03	2.0E+02	1.0E+02			

(continued)

Table 7-2b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
							UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
167	0.73	0.04	0.02	0.19	0.02	5.5E-01	5.0E+01	5.0E+01	N/A			
168	0.86	0.00	0.00	0.14	0.00	1.4E+01	2.0E+04	1.0E+04	1.0E+03			
169	0.84	0.00	0.02	0.14	0.00	2.6E+01	3.0E+04	2.0E+04	1.0E+04			
170	0.86	0.00	0.00	0.14	0.00	3.9E+01	1.0E+04	5.0E+03	5.0E+03			
171	0.84	0.00	0.02	0.14	0.00	4.4E+00	1.0E+04	1.0E+03	1.0E+02			
172	0.71	0.25	0.02	0.02	0.00	8.8E-02	1.7E+00	8.0E-01	1.7E-01			
173	0.74	0.25	0.00	0.01	0.00	1.1E-01	3.0E+02	1.0E+02	5.0E+01			
174	0.74	0.25	0.00	0.01	0.00	2.8E-02	5.0E+02	5.0E+02	2.0E+01			
175	0.74	0.25	0.00	0.01	0.00	1.0E-02	1.0E+01	1.0E+01	8.0E+00			
176	0.74	0.25	0.00	0.01	0.00	8.7E-02	1.0E+02	1.0E+02	5.0E+01			
177	0.72	0.25	0.02	0.01	0.00	4.7E-01	1.0E+04	1.0E+04	3.0E+03			
178	0.70	0.25	0.00	0.04	0.00	2.8E-02	5.0E+02	1.0E+02	2.0E+01			
179	0.72	0.25	0.00	0.03	0.00	1.8E-02	3.0E+06	2.0E+06	1.0E+06			
180	0.65	0.28	0.02	0.04	0.00	4.1E-01	2.0E+01	2.0E+01	5.0E+00			
181	0.74	0.25	0.00	0.01	0.00	3.5E-01	1.0E+03	2.0E+02	1.0E+02			
182	0.70	0.29	0.00	0.01	0.00	1.1E-01	5.0E+01	5.0E+01	N/A			
183	0.72	0.27	0.00	0.01	0.00	1.0E-01	2.0E+04	1.0E+04	1.0E+03			
184	0.72	0.27	0.00	0.01	0.00	1.4E+00	3.0E+04	2.0E+04	1.0E+04			
185	0.72	0.27	0.00	0.01	0.00	3.2E-01	1.0E+04	5.0E+03	5.0E+03			
186	0.72	0.25	0.00	0.03	0.00	9.5E-02	1.0E+04	1.0E+03	1.0E+02			
187	0.95	0.00	0.02	0.03	0.00	1.3E+00	1.7E+00	8.0E-01	1.7E-01		1.7E+00	7.8E+00
188	0.69	0.25	0.02	0.04	0.00	4.1E-02	1.7E+00	8.0E-01	1.7E-01			
189	0.69	0.31	0.00	0.00	0.00	2.4E-01	8.0E-01	5.0E-01	2.0E-01			
190	0.99	0.00	0.00	0.00	0.00	1.0E+00	3.0E+00	2.0E+00	1.3E+00			

(continued)

Table 7-2b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
191	0.74	0.25	0.00	0.00	0.00	1.4E-01	5.0E+02	3.0E+02	1.0E+02			
192	0.73	0.25	0.00	0.02	0.00	5.8E-02	3.0E+01	2.0E+01	2.0E+01			
193	0.99	0.00	0.00	0.00	0.00	9.5E-01	1.0E+03	1.0E+03	5.0E+02			
194	0.74	0.25	0.00	0.00	0.00	1.5E-01	2.0E+04	2.0E+04	1.0E+04			
195	0.94	0.00	0.00	0.05	0.00	8.5E-01	1.0E+04	1.0E+04	3.0E+03			
196	0.74	0.25	0.00	0.00	0.00	4.5E-01	5.0E+06	2.0E+06	1.0E+06			
197	0.97	0.00	0.00	0.02	0.00	6.3E-01	2.0E+01	2.0E+01	1.0E+01			
198	0.73	0.27	0.00	0.00	0.00	7.4E-01	3.0E+02	2.0E+02	1.0E+02			
199	0.99	0.00	0.00	0.00	0.00	2.1E-01	1.0E+03	1.0E+03	N/A			
200	0.71	0.25	0.00	0.04	0.00	3.8E-01	1.0E+04	5.0E+03	3.0E+03			
201	0.99	0.00	0.00	0.00	0.00	1.4E+00	2.0E+03	1.0E+03	1.0E+03			
202	0.94	0.00	0.00	0.05	0.00	7.3E-01	2.0E+03	1.0E+03	1.0E+03			
203	0.99	0.00	0.00	0.00	0.00	9.2E-01	5.0E+02	1.0E+02	3.0E+01			
204	0.50	0.00	0.00	0.00	0.50	1.9E+00	4.0E-01	2.0E-01	8.0E-02	4.8E+00	9.6E+00	2.4E+01
205	0.50	0.00	0.00	0.00	0.50	1.9E-01	5.0E+01	2.0E+01	N/A			
206	0.25	0.25	0.00	0.00	0.50	5.0E-02	2.0E+03	1.0E+03	1.0E+03			
207	0.50	0.00	0.00	0.00	0.50	2.8E-01	5.0E+02	5.0E+02	3.0E+02			
208	0.50	0.00	0.00	0.00	0.50	6.2E-01	3.0E+03	2.0E+03	1.0E+03			
209	0.50	0.00	0.00	0.00	0.50	3.1E-01	5.0E+04	5.0E+04	2.0E+04			
210	0.50	0.00	0.00	0.00	0.50	1.2E+00	3.0E+03	2.0E+03	1.0E+03			
211	0.50	0.00	0.00	0.00	0.50	2.7E-01	3.0E+06	2.0E+06	1.0E+06			
212	0.25	0.25	0.00	0.00	0.50	6.8E-02	1.0E+02	6.0E+01	2.0E+01			
213	0.25	0.25	0.00	0.00	0.50	2.9E-01	5.0E+01	3.0E+01	2.0E+01			
214	0.25	0.25	0.00	0.00	0.50	3.1E-02	1.0E+04	1.0E+04	1.0E+04			

(continued)

Table 7-2b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
							UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
215	0.50	0.00	0.00	0.00	0.50	2.3E-01	3.0E+03	1.0E+03	1.0E+03			
216	0.50	0.00	0.00	0.00	0.50	1.9E+00	3.0E+05	1.0E+05	1.0E+05			
217	0.50	0.00	0.00	0.00	0.50	3.3E-01	2.0E+04	2.0E+04	1.0E+04			
218	0.50	0.00	0.00	0.00	0.50	1.2E+00	3.0E+04	2.0E+04	5.0E+03			
219	0.58	0.28	0.01	0.14	0.00	1.3E-01	1.7E+00	8.0E-01	1.7E-01			
220	0.59	0.28	0.01	0.13	0.00	1.7E-01	3.0E+02	1.0E+02	5.0E+01			
221	0.59	0.28	0.01	0.13	0.00	2.6E-01	5.0E+02	5.0E+02	2.0E+01			
222	0.58	0.28	0.01	0.13	0.00	8.5E-02	1.0E+01	1.0E+01	8.0E+00			
223	0.61	0.03	0.26	0.11	0.00	1.8E+00	1.0E+02	1.0E+02	5.0E+01			
224	0.61	0.03	0.26	0.11	0.00	4.6E+00	1.0E+04	1.0E+04	3.0E+03			
225	0.86	0.03	0.01	0.11	0.00	2.0E+01	5.0E+02	1.0E+02	2.0E+01			
226	0.86	0.03	0.01	0.11	0.00	8.0E+01	3.0E+06	2.0E+06	1.0E+06			
227	0.79	0.06	0.01	0.14	0.00	1.1E+00	2.0E+01	2.0E+01	5.0E+00			
228	0.57	0.03	0.26	0.14	0.00	1.4E+01	1.0E+03	2.0E+02	1.0E+02			
229	0.82	0.03	0.01	0.14	0.00	1.0E+00	5.0E+01	5.0E+01	N/A			
230	0.61	0.03	0.26	0.11	0.00	9.5E+00	2.0E+04	1.0E+04	1.0E+03			
231	0.61	0.03	0.26	0.11	0.00	1.2E+01	3.0E+04	2.0E+04	1.0E+04			
232	0.55	0.03	0.26	0.16	0.00	3.3E+02	1.0E+04	5.0E+03	5.0E+03			
233	0.55	0.03	0.26	0.16	0.00	3.3E+01	1.0E+04	1.0E+03	1.0E+02			
234	0.96	0.04	0.00	0.00	0.00	7.6E-01	4.0E-01	2.0E-01	8.0E-02			
235	1.00	0.00	0.00	0.00	0.00	7.6E-01	3.0E+00	2.0E+00	N/A			
236	0.75	0.25	0.00	0.00	0.00	1.4E-01	5.0E+02	3.0E+02	1.0E+02			
237	0.74	0.25	0.00	0.00	0.00	5.8E-02	3.0E+01	2.0E+01	2.0E+01			
238	1.00	0.00	0.00	0.00	0.00	6.8E-01	1.0E+03	1.0E+03	5.0E+02			

(continued)

Table 7-2b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE UCL2/UCL1 Threshold	95% MOE UCL2/UCL1 Threshold	99% MOE UCL2/UCL1 Threshold	Threshold Ratio > 1 90% MOE	Threshold Ratio > 1 95% MOE	Threshold Ratio > 1 99% MOE
239	0.71	0.25	0.00	0.03	0.00	1.5E-01	2.0E+04	2.0E+04	1.0E+04			
240	0.95	0.00	0.00	0.05	0.00	3.0E-01	3.0E+03	2.0E+03	1.0E+03			
241	0.75	0.25	0.00	0.00	0.00	4.5E-01	3.0E+06	2.0E+06	1.0E+06			
242	0.75	0.25	0.00	0.00	0.00	4.3E+00	2.0E+01	2.0E+01	1.0E+01			
243	0.75	0.25	0.00	0.00	0.00	5.3E-01	5.0E+01	3.0E+01	2.0E+01			
244	0.75	0.25	0.00	0.00	0.00	5.1E+00	1.0E+03	1.0E+03	N/A			
245	0.96	0.00	0.00	0.03	0.00	3.8E-01	3.0E+03	1.0E+03	1.0E+03			
246	1.00	0.00	0.00	0.00	0.00	1.6E+00	2.0E+03	1.0E+03	1.0E+03			
247	0.95	0.00	0.00	0.05	0.00	5.8E-01	2.0E+03	1.0E+03	1.0E+03			
248	1.00	0.00	0.00	0.00	0.00	1.7E+00	5.0E+02	1.0E+02	3.0E+01			

Table 7-3a. RelRisk Outputs for Weighting Scenario 7 and Results of Decision Rule 9 for Option 1D SDL (Part 1 of 2)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
1	OPT 1D SDL	MACT	INCIN	P2_LB	TEQ	0.10	1.6	0.06
2	OPT 1D SDL	MACT	INCIN	P2_LB	HG	0.35	1.2	0.29
3	OPT 1D SDL	MACT	INCIN	P2_LB	CD	0.29	1.2	0.24
4	OPT 1D SDL	MACT	INCIN	P2_LB	PB	0.35	1.2	0.29
5	OPT 1D SDL	MACT	INCIN	P2_LB	AS	-0.15	1.2	-0.13
6	OPT 1D SDL	MACT	INCIN	P2_LB	BE	-0.20	1.2	-0.17
7	OPT 1D SDL	MACT	INCIN	P2_LB	CR_6	-0.10	1.6	-0.06
8	OPT 1D SDL	MACT	INCIN	P2_LB	CR_3	0.15	2.1	0.07
9	OPT 1D SDL	MACT	INCIN	P2_LB	CL2	0.13	1.6	0.08
10	OPT 1D SDL	MACT	INCIN	P2_LB	HCL	-0.15	1.4	-0.11
11	OPT 1D SDL	MACT	INCIN	P2_LB	SB	0.05	1.2	0.04
12	OPT 1D SDL	MACT	INCIN	P2_LB	NI	-0.15	1.6	-0.09
13	OPT 1D SDL	MACT	INCIN	P2_LB	SE	-0.15	1.6	-0.09
14	OPT 1D SDL	MACT	INCIN	P2_LB	BA	-0.15	1.3	-0.11
15	OPT 1D SDL	MACT	INCIN	P2_LB	TL	-0.15	1.3	-0.11
16	OPT 1D SDL	MACT	INCIN	P2_DRY_LB	TEQ	0.14	2.7	0.05
17	OPT 1D SDL	MACT	INCIN	P2_NOTDRY_LB	TEQ	0.09	1.7	0.05
18	OPT 1D SDL	MACT	INCIN	P2_SB	TEQ	0.00	2.5	0.00
19	OPT 1D SDL	MACT	INCIN	P2_SB	HG	-0.25	2.8	-0.09
20	OPT 1D SDL	MACT	INCIN	P2_SB	CD	-0.25	2.8	-0.09
21	OPT 1D SDL	MACT	INCIN	P2_SB	PB	0.00	3.0	0.00
22	OPT 1D SDL	MACT	INCIN	P2_SB	AS	0.00	3.0	0.00

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
23	OPT 1D SDL	MACT	INCIN	P2_SB	BE	0.00	2.0	0.00
24	OPT 1D SDL	MACT	INCIN	P2_SB	CR_6	0.00	2.0	0.00
25	OPT 1D SDL	MACT	INCIN	P2_SB	CR_3	0.00	2.0	0.00
26	OPT 1D SDL	MACT	INCIN	P2_SB	CL2	0.00	2.0	0.00
27	OPT 1D SDL	MACT	INCIN	P2_SB	HCL	-0.50	1.5	-0.33
28	OPT 1D SDL	MACT	INCIN	P2_SB	SB	-0.25	2.8	-0.09
29	OPT 1D SDL	MACT	INCIN	P2_SB	NI	-0.50	2.0	-0.25
30	OPT 1D SDL	MACT	INCIN	P2_SB	SE	-0.50	2.0	-0.25
31	OPT 1D SDL	MACT	INCIN	P2_SB	BA	-0.25	2.8	-0.09
32	OPT 1D SDL	MACT	INCIN	P2_SB	TL	-0.25	2.8	-0.09
33	OPT 1D SDL	MACT	INCIN	P2_HAF	TEQ	0.04	3.1	0.01
34	OPT 1D SDL	MACT	INCIN	P2_HAF	HG	0.05	3.1	0.02
35	OPT 1D SDL	MACT	INCIN	P2_HAF	CD	0.00	3.3	0.00
36	OPT 1D SDL	MACT	INCIN	P2_HAF	PB	0.23	3.0	0.08
37	OPT 1D SDL	MACT	INCIN	P2_HAF	AS	0.00	3.3	0.00
38	OPT 1D SDL	MACT	INCIN	P2_HAF	BE	0.00	3.3	0.00
39	OPT 1D SDL	MACT	INCIN	P2_HAF	CR_6	-0.50	2.0	-0.25
40	OPT 1D SDL	MACT	INCIN	P2_HAF	CR_3	-0.50	2.0	-0.25
41	OPT 1D SDL	MACT	INCIN	P2_HAF	CL2	0.05	2.9	0.02
42	OPT 1D SDL	MACT	INCIN	P2_HAF	HCL	0.25	2.5	0.10
43	OPT 1D SDL	MACT	INCIN	P2_HAF	SB	0.08	2.8	0.03
44	OPT 1D SDL	MACT	INCIN	P2_HAF	NI	-0.25	2.8	-0.09
45	OPT 1D SDL	MACT	INCIN	P2_HAF	SE	-0.30	3.1	-0.10

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
46	OPT 1D SDL	MACT	INCIN	P2_HAF	BA	0.00	3.3	0.00
47	OPT 1D SDL	MACT	INCIN	P2_HAF	TL	-0.30	2.6	-0.11
48	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	TEQ	-0.01	1.6	-0.01
49	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	HG	-0.25	1.3	-0.19
50	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	CD	0.25	1.2	0.21
51	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	PB	0.25	1.2	0.21
52	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	AS	0.00	1.4	0.00
53	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	BE	0.00	1.4	0.00
54	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	CR_6	-0.05	1.6	-0.03
55	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	CR_3	0.20	1.3	0.15
56	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	CL2	0.23	1.2	0.19
57	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	HCL	0.30	1.2	0.25
58	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	SB	0.00	1.6	0.00
59	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	NI	0.25	1.4	0.18
60	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	SE	0.00	1.9	0.00
61	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	BA	0.00	1.6	0.00
62	OPT 1D SDL	MACT	INCIN	NEW_P1_INCIN	TL	0.00	1.6	0.00
63	OPT 1D SDL	MACT	INCIN	NEW_P1_DRY_INCIN	TEQ	-0.33	2.5	-0.13
64	OPT 1D SDL	MACT	INCIN	NEW_P1_NOTDRY_INCIN	TEQ	0.00	1.8	0.00
65	OPT 1D SDL	MACT	CK	NEW_P1_CK	TEQ	0.43	2.9	0.15
66	OPT 1D SDL	MACT	CK	NEW_P1_CK	HG	0.29	2.9	0.10
67	OPT 1D SDL	MACT	CK	NEW_P1_CK	CD	-0.01	3.8	0.00

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
68	OPT 1D SDL	MACT	CK	NEW_P1_CK	PB	-0.01	3.8	0.00
69	OPT 1D SDL	MACT	CK	NEW_P1_CK	AS	0.24	3.3	0.07
70	OPT 1D SDL	MACT	CK	NEW_P1_CK	BE	0.24	3.1	0.08
71	OPT 1D SDL	MACT	CK	NEW_P1_CK	CR_6	-0.01	3.8	0.00
72	OPT 1D SDL	MACT	CK	NEW_P1_CK	CR_3	0.24	3.1	0.08
73	OPT 1D SDL	MACT	CK	NEW_P1_CK	CL2	-0.01	3.8	0.00
74	OPT 1D SDL	MACT	CK	NEW_P1_CK	HCL	0.29	3.4	0.08
75	OPT 1D SDL	MACT	CK	NEW_P1_CK	SB	-0.01	3.8	0.00
76	OPT 1D SDL	MACT	CK	NEW_P1_CK	NI	-0.01	3.8	0.00
77	OPT 1D SDL	MACT	CK	NEW_P1_CK	SE	-0.01	3.8	0.00
78	OPT 1D SDL	MACT	CK	NEW_P1_CK	BA	-0.01	3.8	0.00
79	OPT 1D SDL	MACT	CK	NEW_P1_CK	TL	-0.01	3.8	0.00
80	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	TEQ	0.00	2.0	0.00
81	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	HG	0.00	2.0	0.00
82	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	CD	0.50	1.5	0.33
83	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	PB	0.00	2.0	0.00
84	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	AS	0.00	2.0	0.00
85	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	BE	0.00	2.0	0.00
86	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	CR_6	0.00	2.0	0.00
87	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	CR_3	0.00	2.0	0.00
88	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	CL2	0.00	2.0	0.00
89	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	HCL	0.00	2.0	0.00
90	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	SB	0.50	1.5	0.33

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
91	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	NI	0.00	2.0	0.00
92	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	SE	0.00	2.0	0.00
93	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	BA	0.00	2.0	0.00
94	OPT 1D SDL	MACT	LWAK	NEW_P1_LWAK	TL	0.00	2.0	0.00
95	OPT 1D SDL	MACT	INCIN	P2_SB_LB	TEQ	0.10	1.6	0.06
96	OPT 1D SDL	MACT	INCIN	P2_SB_LB	HG	0.10	1.4	0.07
97	OPT 1D SDL	MACT	INCIN	P2_SB_LB	CD	0.04	1.4	0.03
98	OPT 1D SDL	MACT	INCIN	P2_SB_LB	PB	0.36	1.4	0.25
99	OPT 1D SDL	MACT	INCIN	P2_SB_LB	AS	-0.15	1.2	-0.13
100	OPT 1D SDL	MACT	INCIN	P2_SB_LB	BE	-0.20	1.2	-0.17
101	OPT 1D SDL	MACT	INCIN	P2_SB_LB	CR_6	0.10	1.9	0.05
102	OPT 1D SDL	MACT	INCIN	P2_SB_LB	CR_3	0.15	1.8	0.08
103	OPT 1D SDL	MACT	INCIN	P2_SB_LB	CL2	0.20	1.6	0.13
104	OPT 1D SDL	MACT	INCIN	P2_SB_LB	HCL	-0.15	1.4	-0.11
105	OPT 1D SDL	MACT	INCIN	P2_SB_LB	SB	-0.20	1.2	-0.17
106	OPT 1D SDL	MACT	INCIN	P2_SB_LB	NI	-0.15	1.5	-0.10
107	OPT 1D SDL	MACT	INCIN	P2_SB_LB	SE	-0.15	1.6	-0.09
108	OPT 1D SDL	MACT	INCIN	P2_SB_LB	BA	-0.15	1.2	-0.13
109	OPT 1D SDL	MACT	INCIN	P2_SB_LB	TL	-0.15	1.2	-0.13
110	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	TEQ	0.05	3.7	0.01
111	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	HG	0.25	3.1	0.08
112	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CD	0.00	3.9	0.00
113	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	PB	-0.01	3.8	0.00

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
114	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	AS	0.00	3.9	0.00
115	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	BE	0.33	2.9	0.11
116	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CR_6	0.00	3.9	0.00
117	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CR_3	0.25	3.1	0.08
118	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	CL2	0.00	3.9	0.00
119	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	HCL	0.05	3.7	0.01
120	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	SB	0.25	3.4	0.07
121	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	NI	0.00	3.9	0.00
122	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	SE	0.00	3.9	0.00
123	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	BA	0.00	3.9	0.00
124	OPT 1D SDL	MACT	CK_LWAK	NEW_P1_CK_LWAK	TL	0.00	3.9	0.00
125	OPT 1D SDL	BASELINE	INCIN	P2_LB	TEQ	0.35	1.7	0.20
126	OPT 1D SDL	BASELINE	INCIN	P2_LB	HG	0.35	1.3	0.27
127	OPT 1D SDL	BASELINE	INCIN	P2_LB	CD	0.35	1.3	0.27
128	OPT 1D SDL	BASELINE	INCIN	P2_LB	PB	0.35	1.3	0.27
129	OPT 1D SDL	BASELINE	INCIN	P2_LB	AS	-0.15	1.6	-0.10
130	OPT 1D SDL	BASELINE	INCIN	P2_LB	BE	-0.20	1.3	-0.15
131	OPT 1D SDL	BASELINE	INCIN	P2_LB	CR_6	0.10	2.2	0.04
132	OPT 1D SDL	BASELINE	INCIN	P2_LB	CR_3	0.10	2.5	0.04
133	OPT 1D SDL	BASELINE	INCIN	P2_LB	CL2	0.20	1.6	0.13
134	OPT 1D SDL	BASELINE	INCIN	P2_LB	HCL	-0.15	1.5	-0.10
135	OPT 1D SDL	BASELINE	INCIN	P2_LB	SB	0.10	1.8	0.06
136	OPT 1D SDL	BASELINE	INCIN	P2_LB	NI	-0.15	1.7	-0.09

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
137	OPT 1D SDL	BASELINE	INCIN	P2_LB	SE	-0.15	1.7	-0.09
138	OPT 1D SDL	BASELINE	INCIN	P2_LB	BA	-0.15	1.6	-0.10
139	OPT 1D SDL	BASELINE	INCIN	P2_LB	TL	-0.15	1.6	-0.10
140	OPT 1D SDL	BASELINE	INCIN	P2_DRY_LB	TEQ	0.14	2.7	0.05
141	OPT 1D SDL	BASELINE	INCIN	P2_NOTDRY_LB	TEQ	0.29	1.7	0.17
142	OPT 1D SDL	BASELINE	INCIN	P2_SB	TEQ	0.00	2.5	0.00
143	OPT 1D SDL	BASELINE	INCIN	P2_SB	HG	0.00	3.0	0.00
144	OPT 1D SDL	BASELINE	INCIN	P2_SB	CD	0.00	3.0	0.00
145	OPT 1D SDL	BASELINE	INCIN	P2_SB	PB	0.00	3.0	0.00
146	OPT 1D SDL	BASELINE	INCIN	P2_SB	AS	0.00	3.0	0.00
147	OPT 1D SDL	BASELINE	INCIN	P2_SB	BE	0.00	2.0	0.00
148	OPT 1D SDL	BASELINE	INCIN	P2_SB	CR_6	0.00	2.0	0.00
149	OPT 1D SDL	BASELINE	INCIN	P2_SB	CR_3	0.00	2.0	0.00
150	OPT 1D SDL	BASELINE	INCIN	P2_SB	CL2	0.00	2.0	0.00
151	OPT 1D SDL	BASELINE	INCIN	P2_SB	HCL	-0.25	2.8	-0.09
152	OPT 1D SDL	BASELINE	INCIN	P2_SB	SB	-0.25	2.8	-0.09
153	OPT 1D SDL	BASELINE	INCIN	P2_SB	NI	0.00	2.0	0.00
154	OPT 1D SDL	BASELINE	INCIN	P2_SB	SE	0.00	2.0	0.00
155	OPT 1D SDL	BASELINE	INCIN	P2_SB	BA	-0.25	2.8	-0.09
156	OPT 1D SDL	BASELINE	INCIN	P2_SB	TL	-0.25	2.8	-0.09
157	OPT 1D SDL	BASELINE	INCIN	P2_HAF	TEQ	0.04	3.1	0.01
158	OPT 1D SDL	BASELINE	INCIN	P2_HAF	HG	0.25	2.8	0.09
159	OPT 1D SDL	BASELINE	INCIN	P2_HAF	CD	0.00	3.3	0.00

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
160	OPT 1D SDL	BASELINE	INCIN	P2_HAF	PB	0.23	2.7	0.08
161	OPT 1D SDL	BASELINE	INCIN	P2_HAF	AS	0.38	2.4	0.16
162	OPT 1D SDL	BASELINE	INCIN	P2_HAF	BE	0.25	2.8	0.09
163	OPT 1D SDL	BASELINE	INCIN	P2_HAF	CR_6	0.00	3.0	0.00
164	OPT 1D SDL	BASELINE	INCIN	P2_HAF	CR_3	0.00	3.0	0.00
165	OPT 1D SDL	BASELINE	INCIN	P2_HAF	CL2	-0.20	2.8	-0.07
166	OPT 1D SDL	BASELINE	INCIN	P2_HAF	HCL	0.00	3.3	0.00
167	OPT 1D SDL	BASELINE	INCIN	P2_HAF	SB	0.08	2.8	0.03
168	OPT 1D SDL	BASELINE	INCIN	P2_HAF	NI	0.00	3.3	0.00
169	OPT 1D SDL	BASELINE	INCIN	P2_HAF	SE	-0.05	3.1	-0.02
170	OPT 1D SDL	BASELINE	INCIN	P2_HAF	BA	0.00	3.3	0.00
171	OPT 1D SDL	BASELINE	INCIN	P2_HAF	TL	-0.05	3.1	-0.02
172	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	TEQ	0.19	1.6	0.12
173	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	HG	0.25	1.3	0.19
174	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	CD	0.25	1.3	0.19
175	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	PB	0.25	1.3	0.19
176	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	AS	0.25	1.3	0.19
177	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	BE	0.20	1.6	0.13
178	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	CR_6	0.25	1.7	0.14
179	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	CR_3	0.25	1.7	0.14
180	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	CL2	0.28	1.6	0.18
181	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	HCL	0.25	1.2	0.21
182	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	SB	0.38	1.4	0.26

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
183	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	NI	0.30	1.7	0.18
184	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	SE	0.31	1.6	0.20
185	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	BA	0.31	1.6	0.19
186	OPT 1D SDL	BASELINE	INCIN	NEW_P1_INCIN	TL	0.25	1.8	0.14
187	OPT 1D SDL	BASELINE	INCIN	NEW_P1_DRY_INCIN	TEQ	-0.08	3.0	-0.02
188	OPT 1D SDL	BASELINE	INCIN	NEW_P1_NOTDRY_ INCIN	TEQ	0.20	1.7	0.12
189	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	TEQ	0.43	2.9	0.15
190	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	HG	-0.01	3.8	0.00
191	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	CD	0.24	3.1	0.08
192	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	PB	0.24	3.1	0.08
193	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	AS	-0.01	3.8	0.00
194	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	BE	0.24	3.1	0.08
195	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	CR_6	-0.01	3.8	0.00
196	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	CR_3	0.24	3.1	0.08
197	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	CL2	-0.01	3.8	0.00
198	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	HCL	0.29	3.4	0.08
199	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	SB	-0.01	3.8	0.00
200	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	NI	0.24	3.6	0.07
201	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	SE	-0.01	3.8	0.00
202	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	BA	-0.01	3.8	0.00
203	OPT 1D SDL	BASELINE	CK	NEW_P1_CK	TL	-0.01	3.8	0.00
204	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	TEQ	0.00	2.0	0.00

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
205	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	HG	0.00	2.0	0.00
206	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	CD	0.50	1.5	0.33
207	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	PB	0.00	2.0	0.00
208	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	AS	0.00	2.0	0.00
209	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	BE	0.00	2.0	0.00
210	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	CR_6	0.00	2.0	0.00
211	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	CR_3	0.00	2.0	0.00
212	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	CL2	0.50	1.5	0.33
213	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	HCL	0.50	1.5	0.33
214	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	SB	0.50	1.5	0.33
215	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	NI	0.00	2.0	0.00
216	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	SE	0.00	2.0	0.00
217	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	BA	0.00	2.0	0.00
218	OPT 1D SDL	BASELINE	LWAK	NEW_P1_LWAK	TL	0.00	2.0	0.00
219	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	TEQ	0.35	1.7	0.20
220	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	HG	0.35	1.3	0.27
221	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	CD	0.35	1.3	0.27
222	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	PB	0.36	1.3	0.28
223	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	AS	-0.15	1.6	-0.10
224	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	BE	-0.15	1.3	-0.11
225	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	CR_6	0.10	2.2	0.04
226	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	CR_3	0.10	2.2	0.04
227	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	CL2	0.20	1.6	0.13

(continued)

Table 7-3a. (continued)

Index	MACT Option	MACT or Baseline	Old P1 Category	P2/New P1 Category	Chemical	GS	GS Rel	GS/Rel
228	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	HCL	-0.15	1.5	-0.10
229	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	SB	0.10	1.8	0.06
230	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	NI	-0.15	1.7	-0.09
231	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	SE	-0.15	1.7	-0.09
232	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	BA	-0.15	1.6	-0.10
233	OPT 1D SDL	BASELINE	INCIN	P2_SB_LB	TL	-0.15	1.6	-0.10
234	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	TEQ	0.13	3.5	0.04
235	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	HG	0.00	3.9	0.00
236	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CD	0.25	3.1	0.08
237	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	PB	0.24	3.1	0.08
238	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	AS	0.00	3.9	0.00
239	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	BE	0.25	3.1	0.08
240	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CR_6	0.00	3.9	0.00
241	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CR_3	0.25	3.1	0.08
242	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	CL2	0.25	3.4	0.07
243	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	HCL	0.25	3.1	0.08
244	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	SB	0.25	3.4	0.07
245	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	NI	0.00	3.9	0.00
246	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	SE	0.00	3.9	0.00
247	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	BA	0.00	3.9	0.00
248	OPT 1D SDL	BASELINE	CK_LWAK	NEW_P1_CK_LWAK	TL	0.00	3.9	0.00

Table 7-3b. RelRisk Outputs for Weighting Scenario 7 and Results of Decision Rule 9 for Option 1D SDL (Part 2 of 2)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
1	0.83	0.03	0.01	0.13	0.00	3.0E+00	8.0E+00	4.0E+00	1.7E+00			
2	0.60	0.28	0.01	0.12	0.00	3.2E-01	3.0E+02	1.0E+02	5.0E+01			
3	0.58	0.28	0.03	0.12	0.00	1.2E-01	5.0E+03	2.5E+03	5.0E+02			
4	0.59	0.28	0.01	0.12	0.00	3.6E-01	5.0E+02	5.0E+02	3.0E+02			
5	0.55	0.03	0.26	0.17	0.00	4.3E+01	5.0E+02	5.0E+02	5.0E+02			
6	0.56	0.03	0.28	0.13	0.00	7.9E+00	2.0E+04	1.0E+04	1.0E+04			
7	0.58	0.04	0.26	0.12	0.00	3.1E+01	2.0E+03	1.0E+03	2.0E+02			
8	0.83	0.04	0.01	0.12	0.00	4.0E+00	1.0E+07	1.0E+07	5.0E+06			
9	0.78	0.06	0.03	0.13	0.00	3.4E+00	2.0E+02	6.0E+01	1.0E+01			
10	0.60	0.03	0.26	0.12	0.00	3.2E+01	1.0E+03	1.0E+03	5.0E+02			
11	0.83	0.03	0.03	0.12	0.00	1.2E+00	3.0E+02	3.0E+02	1.0E+02			
12	0.58	0.03	0.26	0.13	0.00	4.3E+01	3.0E+04	1.0E+04	5.0E+03			
13	0.60	0.03	0.26	0.12	0.00	2.7E+01	3.0E+04	2.0E+04	1.0E+04			
14	0.58	0.03	0.26	0.13	0.00	6.4E+03	5.0E+04	3.0E+04	1.0E+04			
15	0.58	0.03	0.26	0.13	0.00	2.7E+02	3.0E+04	2.0E+03	1.0E+03			
16	0.56	0.04	0.06	0.06	0.28	2.0E+00	8.0E+00	4.0E+00	1.7E+00			1.2E+00
17	0.80	0.03	0.01	0.16	0.00	1.8E+00	8.0E+00	4.0E+00	1.7E+00			
18	0.62	0.00	0.00	0.03	0.36	N/A	N/A	N/A	N/A			
19	0.52	0.00	0.25	0.03	0.21	4.7E+01	3.0E+02	1.0E+02	5.0E+01			
20	0.52	0.00	0.25	0.03	0.21	1.7E+02	5.0E+03	2.5E+03	5.0E+02			
21	0.77	0.00	0.00	0.03	0.21	7.3E+01	5.0E+02	5.0E+02	3.0E+02			
22	0.75	0.00	0.00	0.03	0.23	2.4E+02	5.0E+02	5.0E+02	5.0E+02			
23	0.60	0.00	0.00	0.03	0.37	4.4E+02	2.0E+04	1.0E+04	1.0E+04			

(continued)

Table 7-3b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	**CountZero**	**CountP1**	**CountM1**	**Count888**	**Count999**	**P2 UCL/ P1UCL**	**UCL2/UCL1 Threshold**	**UCL2/UCL1 Threshold**	**UCL2/UCL1 Threshold**	**90% MOE**	**95% MOE**	**99% MOE**
24	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
25	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
26	0.60	0.00	0.00	0.03	0.37	1.5E+01	2.0E+02	6.0E+01	1.0E+01			1.5E+00
27	0.35	0.00	0.25	0.03	0.37	4.0E+02	1.0E+03	1.0E+03	5.0E+02			
28	0.52	0.00	0.25	0.03	0.21	4.6E+02	3.0E+02	3.0E+02	1.0E+02	1.5E+00	1.5E+00	4.6E+00
29	0.30	0.00	0.25	0.03	0.42	1.2E+02	3.0E+04	1.0E+04	5.0E+03			
30	0.30	0.00	0.25	0.03	0.42	N/A	N/A	N/A	N/A			
31	0.52	0.00	0.25	0.03	0.21	7.2E+03	5.0E+04	3.0E+04	1.0E+04			
32	0.52	0.00	0.25	0.03	0.21	1.9E+03	3.0E+04	2.0E+03	1.0E+03			1.9E+00
33	0.84	0.02	0.01	0.13	0.00	2.6E+01	8.0E+00	4.0E+00	1.7E+00	3.2E+00	6.5E+00	1.5E+01
34	0.82	0.02	0.00	0.16	0.00	1.8E+00	3.0E+02	1.0E+02	5.0E+01			
35	0.86	0.00	0.00	0.14	0.00	1.8E+01	5.0E+03	2.5E+03	5.0E+02			
36	0.61	0.25	0.01	0.13	0.00	7.9E-01	5.0E+02	5.0E+02	3.0E+02			
37	0.86	0.00	0.00	0.14	0.00	4.1E+00	5.0E+02	5.0E+02	5.0E+02			
38	0.82	0.00	0.00	0.18	0.00	3.9E+00	2.0E+04	1.0E+04	1.0E+04			
39	0.34	0.00	0.25	0.14	0.27	4.9E+00	2.0E+03	1.0E+03	2.0E+02			
40	0.34	0.00	0.25	0.14	0.27	2.1E+00	1.0E+07	1.0E+07	5.0E+06			
41	0.80	0.02	0.00	0.18	0.00	4.8E+00	2.0E+02	6.0E+01	1.0E+01			
42	0.61	0.25	0.00	0.14	0.00	3.0E-01	1.0E+03	1.0E+03	5.0E+02			
43	0.73	0.04	0.02	0.19	0.02	6.5E+00	3.0E+02	3.0E+02	1.0E+02			
44	0.61	0.00	0.25	0.14	0.00	2.3E+01	3.0E+04	1.0E+04	5.0E+03			
45	0.54	0.00	0.27	0.19	0.00	2.0E+02	3.0E+04	2.0E+04	1.0E+04			
46	0.86	0.00	0.00	0.14	0.00	2.6E+02	5.0E+04	3.0E+04	1.0E+04			
47	0.59	0.00	0.27	0.14	0.00	7.3E+00	3.0E+04	2.0E+03	1.0E+03			

(continued)

Table 7-3b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
48	0.98	0.00	0.00	0.02	0.00	1.3E+00	8.0E+00	4.0E+00	1.7E+00			
49	0.74	0.00	0.25	0.01	0.00	1.5E+00	3.0E+02	1.0E+02	5.0E+01			
50	0.74	0.25	0.00	0.01	0.00	2.2E-01	5.0E+03	2.5E+03	5.0E+02			
51	0.74	0.25	0.00	0.01	0.00	1.5E-01	5.0E+02	5.0E+02	3.0E+02			
52	0.99	0.00	0.00	0.01	0.00	1.5E+00	5.0E+02	5.0E+02	5.0E+02			
53	0.99	0.00	0.00	0.01	0.00	1.5E+00	2.0E+04	1.0E+04	1.0E+04			
54	0.95	0.00	0.02	0.03	0.00	1.8E+00	2.0E+03	1.0E+03	2.0E+02			
55	0.72	0.25	0.02	0.01	0.00	7.9E-01	1.0E+07	1.0E+07	5.0E+06			
56	0.70	0.27	0.02	0.01	0.00	3.8E-02	2.0E+02	6.0E+01	1.0E+01			
57	0.72	0.27	0.00	0.01	0.00	2.8E-02	1.0E+03	1.0E+03	5.0E+02			
58	0.99	0.00	0.00	0.01	0.00	9.9E-01	3.0E+02	3.0E+02	1.0E+02			
59	0.74	0.25	0.00	0.01	0.00	9.3E-01	3.0E+04	1.0E+04	5.0E+03			
60	0.99	0.00	0.00	0.01	0.00	2.5E+00	3.0E+04	2.0E+04	1.0E+04			
61	0.99	0.00	0.00	0.01	0.00	1.2E+00	5.0E+04	3.0E+04	1.0E+04			
62	0.99	0.00	0.00	0.01	0.00	7.7E-01	3.0E+04	2.0E+03	1.0E+03			
63	0.70	0.00	0.27	0.03	0.00	3.1E+00	8.0E+00	4.0E+00	1.7E+00			1.8E+00
64	0.91	0.00	0.00	0.09	0.00	1.3E+00	8.0E+00	4.0E+00	1.7E+00			
65	0.69	0.31	0.00	0.00	0.00	4.7E-01	1.7E+00	8.0E-01	3.0E-01			
66	0.73	0.27	0.00	0.00	0.00	6.3E-01	5.0E+00	3.0E+00	1.7E+00			
67	0.99	0.00	0.00	0.00	0.00	1.0E+00	2.0E+03	1.0E+03	5.0E+02			
68	0.98	0.00	0.00	0.02	0.00	7.8E-01	5.0E+02	5.0E+02	3.0E+02			
69	0.74	0.25	0.00	0.00	0.00	3.6E-01	2.0E+03	1.0E+03	1.0E+03			
70	0.74	0.25	0.00	0.00	0.00	1.1E-01	3.0E+04	2.0E+04	1.0E+04			
71	0.94	0.00	0.00	0.05	0.00	7.1E-01	1.0E+04	1.0E+04	5.0E+03			

(continued)

Table 7-3b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
72	0.74	0.25	0.00	0.00	0.00	1.8E-01	5.0E+06	2.0E+06	1.0E+06			
73	0.96	0.00	0.00	0.04	0.00	6.3E-01	4.0E+01	2.0E+01	2.0E+01			
74	0.73	0.27	0.00	0.00	0.00	8.6E-01	3.0E+02	3.0E+02	2.0E+02			
75	0.99	0.00	0.00	0.00	0.00	3.6E-01	1.0E+03	1.0E+03	N/A			
76	0.96	0.00	0.00	0.04	0.00	4.6E-01	1.0E+04	5.0E+03	3.0E+03			
77	0.99	0.00	0.00	0.00	0.00	1.3E+00	2.0E+03	1.0E+03	1.0E+03			
78	0.99	0.00	0.00	0.00	0.00	1.1E+00	2.0E+03	1.0E+03	1.0E+03			
79	0.99	0.00	0.00	0.00	0.00	1.5E+00	5.0E+02	1.0E+02	5.0E+01			
80	0.50	0.00	0.00	0.00	0.50	7.9E-01	8.0E+00	3.0E+00	2.0E+00			
81	0.50	0.00	0.00	0.00	0.50	3.0E-01	5.0E+01	3.0E+01	N/A			
82	0.25	0.25	0.00	0.00	0.50	1.1E-01	5.0E+03	5.0E+03	2.0E+03			
83	0.50	0.00	0.00	0.00	0.50	4.1E-01	1.0E+03	1.0E+03	1.0E+03			
84	0.50	0.00	0.00	0.00	0.50	7.3E-01	5.0E+03	5.0E+03	2.0E+03			
85	0.50	0.00	0.00	0.00	0.50	3.8E-01	1.0E+05	5.0E+04	3.0E+04			
86	0.50	0.00	0.00	0.00	0.50	1.4E+00	5.0E+03	5.0E+03	1.0E+03			
87	0.50	0.00	0.00	0.00	0.50	6.3E-01	1.0E+07	3.0E+06	2.0E+06			
88	0.50	0.00	0.00	0.00	0.50	3.3E-01	2.0E+02	6.0E+01	6.0E+01			
89	0.50	0.00	0.00	0.00	0.50	7.1E-01	1.0E+02	1.0E+02	5.0E+01			
90	0.25	0.25	0.00	0.00	0.50	3.1E-02	1.0E+04	1.0E+04	1.0E+04			
91	0.50	0.00	0.00	0.00	0.50	2.6E-01	3.0E+03	1.0E+03	1.0E+03			
92	0.50	0.00	0.00	0.00	0.50	1.9E+00	3.0E+05	1.0E+05	1.0E+05			
93	0.50	0.00	0.00	0.00	0.50	3.3E-01	3.0E+04	2.0E+04	1.0E+04			
94	0.50	0.00	0.00	0.00	0.50	1.2E+00	3.0E+04	2.0E+04	5.0E+03			
95	0.85	0.03	0.01	0.12	0.00	1.8E+00	8.0E+00	4.0E+00	1.7E+00			

(continued)

Table 7-3b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
							UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
96	0.86	0.03	0.01	0.11	0.00	4.7E-01	3.0E+02	1.0E+02	5.0E+01			
97	0.84	0.03	0.03	0.11	0.00	2.9E-01	5.0E+03	2.5E+03	5.0E+02			
98	0.60	0.28	0.01	0.11	0.00	2.1E-01	5.0E+02	5.0E+02	3.0E+02			
99	0.57	0.03	0.26	0.14	0.00	4.3E+01	5.0E+02	5.0E+02	5.0E+02			
100	0.59	0.03	0.28	0.11	0.00	7.9E+00	2.0E+04	1.0E+04	1.0E+04			
101	0.86	0.03	0.01	0.11	0.00	9.7E+01	2.0E+03	1.0E+03	2.0E+02			
102	0.84	0.04	0.01	0.11	0.00	1.6E+02	1.0E+07	1.0E+07	5.0E+06			
103	0.82	0.06	0.01	0.11	0.00	3.3E+00	2.0E+02	6.0E+01	1.0E+01			
104	0.61	0.03	0.26	0.11	0.00	3.2E+01	1.0E+03	1.0E+03	5.0E+02			
105	0.59	0.03	0.28	0.11	0.00	3.0E+00	3.0E+02	3.0E+02	1.0E+02			
106	0.61	0.03	0.26	0.11	0.00	4.3E+01	3.0E+04	1.0E+04	5.0E+03			
107	0.61	0.03	0.26	0.11	0.00	2.7E+01	3.0E+04	2.0E+04	1.0E+04			
108	0.59	0.03	0.26	0.13	0.00	6.4E+03	5.0E+04	3.0E+04	1.0E+04			
109	0.59	0.03	0.26	0.13	0.00	2.7E+02	3.0E+04	2.0E+03	1.0E+03			
110	0.98	0.02	0.00	0.00	0.00	6.4E-01	1.7E+00	8.0E-01	3.0E-01			
111	0.75	0.25	0.00	0.00	0.00	6.3E-01	5.0E+00	3.0E+00	N/A			
112	1.00	0.00	0.00	0.00	0.00	9.4E-01	2.0E+03	1.0E+03	5.0E+02			
113	0.96	0.00	0.00	0.03	0.00	8.4E-01	5.0E+02	5.0E+02	3.0E+02			
114	1.00	0.00	0.00	0.00	0.00	5.7E-01	2.0E+03	1.0E+03	1.0E+03			
115	0.73	0.27	0.00	0.00	0.00	1.1E-01	3.0E+04	2.0E+04	1.0E+04			
116	0.98	0.00	0.00	0.02	0.00	2.9E-01	5.0E+03	5.0E+03	1.0E+03			
117	0.75	0.25	0.00	0.00	0.00	1.8E-01	5.0E+06	2.0E+06	1.0E+06			
118	0.98	0.00	0.00	0.02	0.00	8.3E-01	4.0E+01	2.0E+01	2.0E+01			
119	0.98	0.02	0.00	0.00	0.00	4.9E-01	1.0E+02	1.0E+02	5.0E+01			

(continued)

Table 7-3b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
120	0.75	0.25	0.00	0.00	0.00	5.1E+00	1.0E+03	1.0E+03	N/A			
121	0.96	0.00	0.00	0.03	0.00	4.6E-01	3.0E+03	1.0E+03	1.0E+03			
122	1.00	0.00	0.00	0.00	0.00	1.6E+00	2.0E+03	1.0E+03	1.0E+03			
123	1.00	0.00	0.00	0.00	0.00	7.2E-01	2.0E+03	1.0E+03	1.0E+03			
124	1.00	0.00	0.00	0.00	0.00	1.9E+00	5.0E+02	1.0E+02	5.0E+01			
125	0.58	0.28	0.01	0.13	0.00	1.3E-01	1.7E+00	8.0E-01	1.7E-01			
126	0.60	0.28	0.01	0.12	0.00	1.7E-01	3.0E+02	1.0E+02	5.0E+01			
127	0.60	0.28	0.01	0.12	0.00	5.0E-02	5.0E+02	5.0E+02	2.0E+01			
128	0.59	0.28	0.01	0.12	0.00	5.2E-02	1.0E+01	1.0E+01	8.0E+00			
129	0.60	0.03	0.26	0.12	0.00	1.8E+00	1.0E+02	1.0E+02	5.0E+01			
130	0.58	0.03	0.28	0.12	0.00	4.6E+00	1.0E+04	1.0E+04	3.0E+03			
131	0.85	0.03	0.01	0.12	0.00	4.2E+00	5.0E+02	1.0E+02	2.0E+01			
132	0.85	0.03	0.01	0.12	0.00	1.7E+00	3.0E+06	2.0E+06	1.0E+06			
133	0.78	0.06	0.01	0.15	0.00	1.1E+00	2.0E+01	2.0E+01	5.0E+00			
134	0.60	0.03	0.26	0.12	0.00	9.1E+00	1.0E+03	2.0E+02	1.0E+02			
135	0.83	0.03	0.01	0.13	0.00	6.8E-01	5.0E+01	5.0E+01	N/A			
136	0.60	0.03	0.26	0.12	0.00	9.5E+00	2.0E+04	1.0E+04	1.0E+03			
137	0.60	0.03	0.26	0.12	0.00	1.2E+01	3.0E+04	2.0E+04	1.0E+04			
138	0.56	0.03	0.26	0.15	0.00	3.3E+02	1.0E+04	5.0E+03	5.0E+03			
139	0.56	0.03	0.26	0.15	0.00	3.3E+01	1.0E+04	1.0E+03	1.0E+02			
140	0.56	0.04	0.06	0.06	0.28	4.7E+00	1.7E+00	8.0E-01	1.7E-01	2.8E+00	5.9E+00	2.8E+01
141	0.50	0.28	0.03	0.19	0.00	5.9E-02	1.7E+00	8.0E-01	1.7E-01			
142	0.62	0.00	0.00	0.03	0.36	N/A	N/A	N/A	N/A			
143	0.77	0.00	0.00	0.03	0.21	7.7E+00	3.0E+02	1.0E+02	5.0E+01			

(continued)

Table 7-3b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE UCL2/UCL1 Threshold	95% MOE UCL2/UCL1 Threshold	99% MOE UCL2/UCL1 Threshold	Threshold Ratio > 1 90% MOE	Threshold Ratio > 1 95% MOE	Threshold Ratio > 1 99% MOE
144	0.77	0.00	0.00	0.03	0.21	3.3E+01	5.0E+02	5.0E+02	2.0E+01			1.6E+00
145	0.77	0.00	0.00	0.03	0.21	1.3E+01	1.0E+01	1.0E+01	8.0E+00	1.3E+00	1.3E+00	1.7E+00
146	0.75	0.00	0.00	0.03	0.23	1.4E+02	1.0E+02	1.0E+02	5.0E+01	1.4E+00	1.4E+00	2.7E+00
147	0.60	0.00	0.00	0.03	0.37	2.8E+02	1.0E+04	1.0E+04	3.0E+03			
148	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
149	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
150	0.60	0.00	0.00	0.03	0.37	1.3E+01	2.0E+01	2.0E+01	5.0E+00			2.6E+00
151	0.50	0.00	0.25	0.03	0.23	2.0E+02	1.0E+03	2.0E+02	1.0E+02		1.0E+00	2.0E+00
152	0.52	0.00	0.25	0.03	0.21	7.9E+01	5.0E+01	5.0E+01	N/A	1.6E+00	1.6E+00	
153	0.55	0.00	0.00	0.03	0.42	1.7E+01	2.0E+04	1.0E+04	1.0E+03			
154	0.55	0.00	0.00	0.03	0.42	N/A	N/A	N/A	N/A			
155	0.52	0.00	0.25	0.03	0.21	2.1E+03	1.0E+04	5.0E+03	5.0E+03			
156	0.52	0.00	0.25	0.03	0.21	1.8E+02	1.0E+04	1.0E+03	1.0E+02			1.8E+00
157	0.84	0.02	0.01	0.13	0.00	3.5E+01	1.7E+00	8.0E-01	1.7E-01	2.0E+01	4.3E+01	2.0E+02
158	0.59	0.25	0.00	0.16	0.00	3.2E-02	3.0E+02	1.0E+02	5.0E+01			
159	0.86	0.00	0.00	0.14	0.00	1.7E+00	5.0E+02	5.0E+02	2.0E+01			
160	0.61	0.25	0.01	0.13	0.00	4.6E-03	1.0E+01	1.0E+01	8.0E+00			
161	0.56	0.29	0.00	0.14	0.00	1.1E-01	1.0E+02	1.0E+02	5.0E+01			
162	0.55	0.25	0.00	0.19	0.00	2.3E-01	1.0E+04	1.0E+04	3.0E+03			
163	0.59	0.00	0.00	0.14	0.27	3.5E+00	5.0E+02	1.0E+02	2.0E+01			
164	0.59	0.00	0.00	0.14	0.27	8.0E-01	3.0E+06	2.0E+06	1.0E+06			
165	0.54	0.02	0.25	0.19	0.00	1.0E+01	2.0E+01	2.0E+01	5.0E+00			2.1E+00
166	0.86	0.00	0.00	0.14	0.00	1.9E+01	1.0E+03	2.0E+02	1.0E+02			
167	0.73	0.04	0.02	0.19	0.02	5.5E-01	5.0E+01	5.0E+01	N/A			

(continued)

Table 7-3b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
							UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
168	0.86	0.00	0.00	0.14	0.00	1.4E+01	2.0E+04	1.0E+04	1.0E+03			
169	0.84	0.00	0.02	0.14	0.00	2.6E+01	3.0E+04	2.0E+04	1.0E+04			
170	0.86	0.00	0.00	0.14	0.00	3.9E+01	1.0E+04	5.0E+03	5.0E+03			
171	0.84	0.00	0.02	0.14	0.00	4.4E+00	1.0E+04	1.0E+03	1.0E+02			
172	0.71	0.25	0.02	0.02	0.00	8.8E-02	1.7E+00	8.0E-01	1.7E-01			
173	0.74	0.25	0.00	0.01	0.00	1.1E-01	3.0E+02	1.0E+02	5.0E+01			
174	0.74	0.25	0.00	0.01	0.00	2.8E-02	5.0E+02	5.0E+02	2.0E+01			
175	0.74	0.25	0.00	0.01	0.00	1.0E-02	1.0E+01	1.0E+01	8.0E+00			
176	0.74	0.25	0.00	0.01	0.00	8.7E-02	1.0E+02	1.0E+02	5.0E+01			
177	0.72	0.25	0.02	0.01	0.00	4.7E-01	1.0E+04	1.0E+04	3.0E+03			
178	0.70	0.25	0.00	0.04	0.00	2.8E-02	5.0E+02	1.0E+02	2.0E+01			
179	0.72	0.25	0.00	0.03	0.00	1.8E-02	3.0E+06	2.0E+06	1.0E+06			
180	0.65	0.28	0.02	0.04	0.00	4.1E-01	2.0E+01	2.0E+01	5.0E+00			
181	0.74	0.25	0.00	0.01	0.00	3.5E-01	1.0E+03	2.0E+02	1.0E+02			
182	0.70	0.29	0.00	0.01	0.00	1.1E-01	5.0E+01	5.0E+01	N/A			
183	0.72	0.27	0.00	0.01	0.00	1.0E-01	2.0E+04	1.0E+04	1.0E+03			
184	0.72	0.27	0.00	0.01	0.00	1.4E+00	3.0E+04	2.0E+04	1.0E+04			
185	0.72	0.27	0.00	0.01	0.00	3.2E-01	1.0E+04	5.0E+03	5.0E+03			
186	0.72	0.25	0.00	0.03	0.00	9.5E-02	1.0E+04	1.0E+03	1.0E+02			
187	0.95	0.00	0.02	0.03	0.00	1.3E+00	1.7E+00	8.0E-01	1.7E-01		1.7E+00	7.8E+00
188	0.69	0.25	0.02	0.04	0.00	4.1E-02	1.7E+00	8.0E-01	1.7E-01			
189	0.69	0.31	0.00	0.00	0.00	2.4E-01	8.0E-01	5.0E-01	2.0E-01			
190	0.99	0.00	0.00	0.00	0.00	1.0E+00	3.0E+00	2.0E+00	1.3E+00			
191	0.74	0.25	0.00	0.00	0.00	1.4E-01	5.0E+02	3.0E+02	1.0E+02			

(continued)

Table 7-3b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
192	0.73	0.25	0.00	0.02	0.00	5.8E-02	3.0E+01	2.0E+01	2.0E+01			
193	0.99	0.00	0.00	0.00	0.00	9.5E-01	1.0E+03	1.0E+03	5.0E+02			
194	0.74	0.25	0.00	0.00	0.00	1.5E-01	2.0E+04	2.0E+04	1.0E+04			
195	0.94	0.00	0.00	0.05	0.00	8.5E-01	1.0E+04	1.0E+04	3.0E+03			
196	0.74	0.25	0.00	0.00	0.00	4.5E-01	5.0E+06	2.0E+06	1.0E+06			
197	0.97	0.00	0.00	0.02	0.00	6.3E-01	2.0E+01	2.0E+01	1.0E+01			
198	0.73	0.27	0.00	0.00	0.00	7.4E-01	3.0E+02	2.0E+02	1.0E+02			
199	0.99	0.00	0.00	0.00	0.00	2.1E-01	1.0E+03	1.0E+03	N/A			
200	0.71	0.25	0.00	0.04	0.00	3.8E-01	1.0E+04	5.0E+03	3.0E+03			
201	0.99	0.00	0.00	0.00	0.00	1.4E+00	2.0E+03	1.0E+03	1.0E+03			
202	0.94	0.00	0.00	0.05	0.00	7.3E-01	2.0E+03	1.0E+03	1.0E+03			
203	0.99	0.00	0.00	0.00	0.00	9.2E-01	5.0E+02	1.0E+02	3.0E+01			
204	0.50	0.00	0.00	0.00	0.50	1.9E+00	4.0E-01	2.0E-01	8.0E-02	4.8E+00	9.6E+00	2.4E+01
205	0.50	0.00	0.00	0.00	0.50	1.9E-01	5.0E+01	2.0E+01	N/A			
206	0.25	0.25	0.00	0.00	0.50	5.0E-02	2.0E+03	1.0E+03	1.0E+03			
207	0.50	0.00	0.00	0.00	0.50	2.8E-01	5.0E+02	5.0E+02	3.0E+02			
208	0.50	0.00	0.00	0.00	0.50	6.2E-01	3.0E+03	2.0E+03	1.0E+03			
209	0.50	0.00	0.00	0.00	0.50	3.1E-01	5.0E+04	5.0E+04	2.0E+04			
210	0.50	0.00	0.00	0.00	0.50	1.2E+00	3.0E+03	2.0E+03	1.0E+03			
211	0.50	0.00	0.00	0.00	0.50	2.7E-01	3.0E+06	2.0E+06	1.0E+06			
212	0.25	0.25	0.00	0.00	0.50	6.8E-02	1.0E+02	6.0E+01	2.0E+01			
213	0.25	0.25	0.00	0.00	0.50	2.9E-01	5.0E+01	3.0E+01	2.0E+01			
214	0.25	0.25	0.00	0.00	0.50	3.1E-02	1.0E+04	1.0E+04	1.0E+04			
215	0.50	0.00	0.00	0.00	0.50	2.3E-01	3.0E+03	1.0E+03	1.0E+03			

(continued)

Table 7-3b. (continued)

							90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
216	0.50	0.00	0.00	0.00	0.50	1.9E+00	3.0E+05	1.0E+05	1.0E+05			
217	0.50	0.00	0.00	0.00	0.50	3.3E-01	2.0E+04	2.0E+04	1.0E+04			
218	0.50	0.00	0.00	0.00	0.50	1.2E+00	3.0E+04	2.0E+04	5.0E+03			
219	0.58	0.28	0.01	0.14	0.00	1.3E-01	1.7E+00	8.0E-01	1.7E-01			
220	0.59	0.28	0.01	0.13	0.00	1.7E-01	3.0E+02	1.0E+02	5.0E+01			
221	0.59	0.28	0.01	0.13	0.00	2.6E-01	5.0E+02	5.0E+02	2.0E+01			
222	0.58	0.28	0.01	0.13	0.00	8.5E-02	1.0E+01	1.0E+01	8.0E+00			
223	0.61	0.03	0.26	0.11	0.00	1.8E+00	1.0E+02	1.0E+02	5.0E+01			
224	0.61	0.03	0.26	0.11	0.00	4.6E+00	1.0E+04	1.0E+04	3.0E+03			
225	0.86	0.03	0.01	0.11	0.00	2.0E+01	5.0E+02	1.0E+02	2.0E+01			
226	0.86	0.03	0.01	0.11	0.00	8.0E+01	3.0E+06	2.0E+06	1.0E+06			
227	0.79	0.06	0.01	0.14	0.00	1.1E+00	2.0E+01	2.0E+01	5.0E+00			
228	0.57	0.03	0.26	0.14	0.00	1.4E+01	1.0E+03	2.0E+02	1.0E+02			
229	0.82	0.03	0.01	0.14	0.00	1.0E+00	5.0E+01	5.0E+01	N/A			
230	0.61	0.03	0.26	0.11	0.00	9.5E+00	2.0E+04	1.0E+04	1.0E+03			
231	0.61	0.03	0.26	0.11	0.00	1.2E+01	3.0E+04	2.0E+04	1.0E+04			
232	0.55	0.03	0.26	0.16	0.00	3.3E+02	1.0E+04	5.0E+03	5.0E+03			
233	0.55	0.03	0.26	0.16	0.00	3.3E+01	1.0E+04	1.0E+03	1.0E+02			
234	0.96	0.04	0.00	0.00	0.00	7.6E-01	4.0E-01	2.0E-01	8.0E-02			
235	1.00	0.00	0.00	0.00	0.00	7.6E-01	3.0E+00	2.0E+00	N/A			
236	0.75	0.25	0.00	0.00	0.00	1.4E-01	5.0E+02	3.0E+02	1.0E+02			
237	0.74	0.25	0.00	0.00	0.00	5.8E-02	3.0E+01	2.0E+01	2.0E+01			
238	1.00	0.00	0.00	0.00	0.00	6.8E-01	1.0E+03	1.0E+03	5.0E+02			
239	0.71	0.25	0.00	0.03	0.00	1.5E-01	2.0E+04	2.0E+04	1.0E+04			

(continued)

Table 7-3b. (continued)

Index	CountZero	CountP1	CountM1	Count888	Count999	P2 UCL/ P1UCL	90% MOE	95% MOE	99% MOE	Threshold Ratio > 1		
							UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	UCL2/UCL1 Threshold	90% MOE	95% MOE	99% MOE
240	0.95	0.00	0.00	0.05	0.00	3.0E-01	3.0E+03	2.0E+03	1.0E+03			
241	0.75	0.25	0.00	0.00	0.00	4.5E-01	3.0E+06	2.0E+06	1.0E+06			
242	0.75	0.25	0.00	0.00	0.00	4.3E+00	2.0E+01	2.0E+01	1.0E+01			
243	0.75	0.25	0.00	0.00	0.00	5.3E-01	5.0E+01	3.0E+01	2.0E+01			
244	0.75	0.25	0.00	0.00	0.00	5.1E+00	1.0E+03	1.0E+03	N/A			
245	0.96	0.00	0.00	0.03	0.00	3.8E-01	3.0E+03	1.0E+03	1.0E+03			
246	1.00	0.00	0.00	0.00	0.00	1.6E+00	2.0E+03	1.0E+03	1.0E+03			
247	0.95	0.00	0.00	0.05	0.00	5.8E-01	2.0E+03	1.0E+03	1.0E+03			
248	1.00	0.00	0.00	0.00	0.00	1.7E+00	5.0E+02	1.0E+02	3.0E+01			

A review of the decision rule results in Tables 7-2 and 7-3 leads to several observations/conclusions. First, of all the individual comparisons (i.e., individual rows in the table), only a relatively small percentage of them trigger Phase II/New Phase I risks that are of potential concern. For the Option 1 Floor SDL MACT standard emissions (Table 7-2) 9 of the 124 comparisons suggest risks of concern at one or more MOE percentiles. For Option 1 Floor SDL baseline emissions, slightly more comparisons (12 of 124) suggest risks of concern at one or more MOE percentiles. For Option 1D SDL MACT standard emissions (Table 7-3), 6 of 124 comparisons are of potential concern while, for baseline emissions, 12 of 124 are of potential concern.

It is also noted that the chemical with the most frequently occurring potential risk concern across the comparison categories and subcategories is dioxins and furans (TEQ), i.e., TEQ is potentially problematic for several Phase II/New Phase I categories/subcategories. TEQ also exhibits the highest threshold exceedance ratios among the chemicals. For non-TEQ chemicals, the threshold exceedance ratios are all less than 10.0 (i.e., non-TEQ chemicals present, at most, inferred risks of less than an order of magnitude above hazard quotients of 1.0 or incremental cancer risks of 1E-5), while exceedance ratios for TEQ exceed 10.0 for several Phase II and New Phase I categories/subcategories and MOE percentiles.[5] The highest non-TEQ chemical threshold exceedance ratio for Option 1 Floor SDL MACT emissions is 9.3 for Phase II SB antimony (by way of comparison to Old Phase I all incinerators at the 99th MOE percentile, see Index 28 in Table 7-2). The highest non-TEQ chemical threshold exceedance ratio for Option 1D SDL MACT emissions is 4.6, also for Phase II SB antimony (by way of comparison to Old Phase I all incinerators at the 99th MOE percentile – see Index 28 of Table 7-3).

It is of interest to examine why TEQ poses potential risks of concern. Accordingly, we will examine one of these problematic comparisons: Phase II HAFs to Old Phase I All Incinerators under the Option 1 Floor SDL MACT emissions scenario at the 95th MOE percentile (Index record 33 in Table 7-2). The threshold exceedance ratios for this comparison are 25, 50, and 118 for 90th, 95th, and 99th percentile MOEs, respectively. The megavariable-specific RelRisk outputs and the weighted outputs aggregated over megavariables are shown below in Table 7-4 (as output by RelRisk in the COMP5_TEQ_RELRSK.CSV detailed output file). The complete COMP5_TEQ_RELRSK.CSV output file is included in Appendix F. Complete RelRisk output tables for all 15 Option 1 Floor and Option 1D MACT comparisons showing risks of potential concern are included in Appendix F.

[5] Note that with EPA's 1985 slope factor, only 1 of these would exceed the threshold by a factor of 10 at the MACT floor standard (Option 1) and none would exceed a factor of 10 at the MACT beyond-the-floor standard for dioxins proposed by EPA (Option 1D).

Table 7-4. Portion of RelRisk Detailed Outputs for Table 7-2, Index 33 Comparison

Variable Results
Emissions Mega-Variable Results:
GSMV = 0.1
GSMV Reliability = 3.2
CountZeroMV = 0.9333333
CountP1MV = 3.333334E-02
CountM1MV = 0
Count888MV = 3.333334E-02
Count999MV = 0
Stack Mega-Variable Results:
GSMV = -0.25
GSMV Reliability = 3.25
CountZeroMV = 0.7166667
CountP1MV = 0
CountM1MV = 0.25
Count888MV = 3.333334E-02
Count999MV = 0
Meteorological Mega-Variable Results:
GSMV = 0
GSMV Reliability = 3.2
CountZeroMV = 0.5283334
CountP1MV = 0
CountM1MV = 0
Count888MV = 0.4627778
Count999MV = 8.888889E-03
Population Mega-Variable Results:
GSMV = -0.05
GSMV Reliability = 2.6
CountZeroMV = 0.95
CountP1MV = 1.666667E-02
CountM1MV = 3.333334E-02
Count888MV = 0
Count999MV = 0
Overall Results Across Mega-Variables:
GrandScore = 0.0375
GrandScore Reliability = 3.05
CountZero = 0.83625
CountP1 = 2.083333E-02
CountM1 = 8.333334E-03

(continued)

Table 7-4. (continued)

Variable Results
Count888 = 0.1323611
Count999 = 2.222222E-03
Pred MOE for 50% MOE = 0.499231
Pred MOE for 90% MOE = 3.993848E-02
Pred MOE for 95% MOE = 1.996924E-02
Pred MOE for 99% MOE = 8.486927E-03

From the across-megavariable, weighted results in Table 7-4, it can be seen that, in fact, the comparison was relatively favorable to the Phase II risk comparison, i.e., the overall Grand Score is slightly positive (0.038) and the Count "+1" (0.021) somewhat exceeds the Count "-1" (0.0083). Nonetheless, the decision rule was first triggered for this comparison because the normalized Grand Score (0.0375/3.05 = 0.0123) fell below the decision rule threshold of 0.02. Once this comparison was triggered and examined by the decision rule, the fact that the upper confidence limit on the 50th percentile Phase II TEQ emission rate (the Phase II and Old Phase I emission distributions were tested for equality at the 50th percentile given the relatively small number of Phase II HAFs, as previously discussed) was significantly higher than the upper confidence limit on the Old Phase I 50th percentile TEQ emission rate, which resulted in proportionately lower MOEs than the Old Phase I MOEs. These relatively low MOEs, combined with the fact that the Old Phase I MOEs do not provide much "buffer" at 8, 4, and 1.7 for the 90th, 95th, and 99th MOE percentiles, respectively (see Table 1-4), resulted in the rejection of the null hypothesis and conclusion that this comparison is of potential risk concern. Although the Phase II HAF TEQ median emission rate (3.1E-5 kg/yr) is indeed approximately an order of magnitude higher than the Old Phase I All Incinerator TEQ median emission rate (4.48E-6 kg/yr), these differences were not found to be statistically significant. Nonetheless, the very sparse sample size (five)[6] for the Phase II HAFs results in the upper confidence limit for the median TEQ emission being defaulted to the maximum observed TEQ emission rate among the five facilities of 1.52E-4 kg/yr. Thus, despite the slightly higher Phase II TEQ emissions rates, it is arguable in this particular comparison that its identification as being of potential risk concern is more a result of uncertainty due to the small sample size than unambiguously risk-unfavorable conditions.

It should also be noted that the exceedances for this comparison are greatly reduced for Option 1D (see Index record 33 in Table 7-3 and COMP17_TEQ_RELRSK.CSV in Appendix F), the beyond-the-floor option EPA is proposing for HAFs. Furthermore, given the uncertainty in the cancer slope factor for dioxins, it is not clear that the Option 1D exceedances (1.1 and 2.5 at the 95th and 99th percentiles, respectively, with EPA's 1985 slope factor) are very meaningful from a risk perspective.

Despite the high correlation between small number of facilities (see Table 2-1) and identification as a comparison of potential risk concern in Table 7-2 or 7-3, not all of those

[6] There are 8 Phase II HAF facilities. Of these, 3 facilities' emissions rates were imputed, leaving only 5 with actual, measured samples.

comparisons identified are of concern merely due to uncertainty related to sample size. For example, the detailed RelRisk results for Index 28 of Table 7-2 (the highest non-TEQ chemical threshold exceedance ratio for Option 1 Floor SDL MACT emissions Phase II SB antimony mentioned previously) are presented in Table 7-5 (from the COMP4_SB_RELRSK.CSV detailed output file). The complete COMP4_SB_RELRSK.CSV output file is included in Appendix F. As can be seen, this comparison was first flagged because of a negative weighted Grand Score (-0.25 with Reliability of 2.75). This risk-unfavorable Grand Score resulted from a negative (-0.5) emissions megavariable Grand Score. Although this Phase II category (solid boilers) includes only four individual facilities, a review of the emission rates from those four, and a comparison of these emissions to the emissions from the Old Phase I All Incinerators comparison group, reveals that those emissions are substantially higher than the Old Phase I comparison group at the median. (Recall that the median was judged to be the appropriate percentile for comparison for Phase II SB from Table 5-7.) The median Old Phase I All Incinerators antimony emission rate is 0.36 kg/yr while the median Phase II solid boilers antimony emission rate is 86 kg/yr. Thus, despite the small number of Phase II facilities, this comparison is of potential risk concern fairly unambiguously with respect to emissions because of significantly higher antimony emission rates.[7] Nevertheless, the small number of facilities makes drawing conclusions inherently uncertain for this category of sources, given the wide variety of site-specific factors that can influence risk. It should also be noted that the threshold exceedance ratios for this comparison are reduced from 3.1 to 1.5 at the 90th and 95th percentiles and from 9.3 to 4.6 at the 99th percentile for Option 1D (see Index record 28 in Table 7-3 and COMP16_SB_RELRSK.CSV in Appendix F) which reflects the beyond-the-floor PM standard EPA is proposing for solid fuel-fired boilers.

Table 7-5. Portion of RelRisk Detailed Outputs for Table 7-2, Index 28 Comparison

Variable Results
Emissions Megavariable Results:
GSMV = -0.5
GSMV Reliability = 2.5
CountZeroMV = 0.4
CountP1MV = 0
CountM1MV = 0.5
Count888MV = 0
Count999MV = 0.1
Stack Megavariable Results:
GSMV = 0.5
GSMV Reliability = 2
CountZeroMV = 0.25

(continued)

[7] This higher median is not a result of a single outlier facility. Each of the four Phase II solid boiler facilities' aggregate emissions (9.8, 9.4, 162.5, and 687.6 kg/yr) exceeded the Old Phase I All Incinerators median emission rate of 0.36 kg/yr.

Table 7-5. (continued)

Variable Results
CountP1MV = 0.25
CountM1MV = 0
Count888MV = 0
Count999MV = 0.5
Meteorological Megavariable Results:
GSMV = 0
GSMV Reliability = 3
CountZeroMV = 0.6361111
CountP1MV = 0
CountM1MV = 0
Count888MV = 0.1
Count999MV = 0.2638889
Population Megavariable Results:
GSMV = 0
GSMV Reliability = 3
CountZeroMV = 0.6333333
CountP1MV = 0
CountM1MV = 0
Count888MV = 0
Count999MV = 0.3666667
Overall Results Across Megavariables:
GrandScore = -0.25
GrandScore Reliability = 2.75
CountZero = 0.5173612
CountP1 = 0
CountM1 = 0.25
Count888 = 0.025
Count999 = 0.2076389
Pred MOE for 50% MOE = 53.62201
Pred MOE for 90% MOE = 0.3217321
Pred MOE for 95% MOE = 0.3217321
Pred MOE for 99% MOE = 0.107244

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8.0 References

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